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THE SHIFTING OF CLIMATIC ZONES AS ILLUSTRATED IN MEXICO

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Most of the studies hitherto made upon changes of climate during historic times have been concerned with regions lying between 25 and 45 degrees from the equator, and chiefly in the northern hemisphere. A few investigators, such as Nachtigal in the southern Sudan, have found apparent evidence of changes along the northern borders of the zone of sub-tropical rains; while others, such as Bowman in southern Peru, have found similar evidence south of the equator. The relation of these changes, however, to those which appear to have taken place farther north has not yet been investigated, as is natural in view of the doubt which many students still feel as to the reality of recent changes of climate in any part of the world. The last two years, however, seem to have placed the pulsatory theory of climatic changes upon a firmer basis than hitherto, and to have prepared the way for a study of the subject in areas beyond the arid zone in which practically all the work has thus far been done. The author's investigations on behalf of the Carnegie Institution of Washington in the southwestern United States and in Mexiço, as described in recent numbers of this *Bulletin*,† the *Geographical Journal*,‡ the *American Journal of Science*,§ and *Harper's Magazine*,‖ have convinced him that these regions have been subject to pulsations of the same nature and magnitude as those of central and western

* A chapter from a forthcoming volume to be published by the Carnegie Institution of Washington under the title "The Climatic Factor as Illustrated in Arid America." Presented in substance at the Ninth Annual Meeting of the Association of American Geographers at New Haven, Dec. 27 and 28, 1912.

† Vol. 44, 1912, pp. 801–822. ‡ Vol. 40, 1912, pp. 264–280 and 392–411. § [Will appear shortly.

‖ Vol. 123, 1911, pp. 50–58; Vol. 124, 1912, pp. 291–301; Vol. 125, 1912, pp. 292–302.

Asia and the lands surrounding the Mediterranean Sea. This conclusion has been strengthened by an entirely independent investigation of a considerable number of curves of tree growth derived partly from thousands of "stem analyses" made by the Forest Service of the United States and most kindly placed at his disposal by the Forester, Mr. Henry S. Graves, and partly from measurements of the rate of growth of the huge sequoias of California, made by the author. These curves, as is shown in the articles already referred to, are in their main features similar to the curve of climatic change in the eastern hemisphere as derived from observations upon ruins, ancient roads, salt lakes, dry springs, and other phenomena. The logical inference seems to be that the continental regions lying in the more or less arid portions of the globe between 25 and 45 degrees north of the equator in both hemispheres are subject to synchronous climatic cycles, having a periodicity of hundreds and perhaps thousands of years.

If we accept this conclusion, the next problem is the investigation of the possible extension of these changes toward the north and south. One of the best places for such an investigation is Mexico. During the spring of 1912, in pursuance of his work as Research Associate of the Carnegie Institution of Washington, the writer made a journey to the City of Mexico, in lat. 19½° N., to Oaxaca and Mitla, in lat. 16° N., and to the Peninsula of Yucatan, in lat. 20° to 21° N. In all of these places evidence of changes of climate appeared to an unexpected degree. Most of the evidence is similar to that found in the dry regions farther north and in Asia, but there is one interesting and suggestive difference connected with the location of ruins among tropical forests. Taken as a whole the evidence as to changes of climate within the tropics may be discussed under four chief heads: first, the recent fluctuations of the lakes near the City of Mexico; second, the evidences of a change in the conditions of the Basin of Mexico during the time of ancient civilizations; third, the alluvial terraces found near Mexico and in Oaxaca; and fourth, the ruins of Yucatan.

In the *Monthly Weather Review* for November, 1908, I have discussed the City of Mexico and Lake Tezcuco, in their relation to changes of climate. In considering this matter here, I shall largely follow that article, but shall add new facts which have come to light since it was written. The City of Mexico lies 7,400 feet above the sea near the salt lake of Tezcuco, and the tributary fresh lakes of Xochimilco and others. The basin containing these lakes is similar

in its general features to that of the Great Salt Lake in Utah, Lop Nor in Central Asia, and Seistan in Eastern Persia. Accurate historic records of the country extend back to the time of the Spanish invasion in 1519, and before that we have fairly reliable traditions for at least 200 years more. It is probable that when Mr. A. F. Bandelier has finished the investigation of manuscripts which he is now conducting on behalf of the Carnegie Institution our information will extend farther back and will be much more full than at present. Taking merely the 600 years for which we now have data we find that during that time there appears to have been a slight but appreciable change of climate in Mexico similar to that which has apparently occurred in Asia. The evidence is somewhat masked because the natural course of events has been interrupted by various works of man, such as the dikes, canals and tunnels which have been built since 1446 to regulate the waters of Tezcuco and its three tributary lakes. Nevertheless, there have been certain periods when nature has triumphed over human endeavor and the waters have returned to the level which they would naturally occupy if man had never interfered. A comparison of the chief epochs of this sort seems to afford some ground for the belief that the climate of Mexico has passed through fluctuations like those of Asia on the one hand, and of more northern regions in America, such as California and New Mexico, on the other hand.

The great authority on early Mexico is Humboldt, whose "Essai Politique sur le Royaume de la Nouvelle-Espagne" was published in 1811 as the third part of the "Voyage de Humboldt et Bonpland." Later and less authoritative writers, such as Prescott and Romero, follow him closely, adding little that is new. Humboldt specifically states his belief that the climate of Mexico in his day was more arid than it was at the time of the founding of the capital about 1325 A. D. He attributes the change in part to undefined meteorological causes whereby evaporation has exceeded precipitation, and in part to the reckless destruction of forests by the Spaniards. He is sure that the level of Lake Tezcuco has fallen, through natural causes as well as through the works of man, and cites this fact as the chief evidence of a change of climate.

According to tradition, the Aztec founders of Mexico, like most of the world's great races, came from the north. After a century of adventurous wanderings, enlivened by the vicissitudes of war, conquest and slavery, they appear to have reached the shores of Lake Tezcuco about 1325 A. D. Hoping for peace and safety, they lo-

cated themselves on some small islets several miles from the shore. There they laid the foundations of the present proud City of Mexico by sinking piles into the marshy shallows and erecting upon them light huts of reeds and rushes above the reach of the water. During the succeeding century, according to Humboldt's lucid account, the city grew and prospered and its rule spread over the neighboring regions. It was still an island city with houses on piles, with canals instead of streets in many cases, and with canoes in place of beasts of burden. Sometimes it suffered when the lake rose more than usual, which was presumably the reason for building the first known dike in the year 1446 A. D. Possibly, however, the dike happened to be built then merely because of an advance in the art of engineering; or perhaps it was because the increasing number of buildings in the city caused the land to settle, as it has done in recent years, when the erection of the new National Theater, for instance, has caused a local subsidence of four or five feet which is evident to the most casual observer by reason of the warping of the pavements of the streets. It seems probable, however, that the building of the dike may have had something to do with climate rather than with the other causes, for the water did not remain at a high level all the time thereafter, but at times, as happened near the end of the fifteenth century, fell so low that the city suffered much distress because canoes laden with supplies of food could not come in as formerly from the surrounding country. When Cortez came to Mexico in 1519 the capital was still a western Venice. He describes it as located on an island two leagues from the mainland. In order to besiege it effectively he was obliged to build brigantines, and in these he was able to sail completely around the city, except for a small distance on the southwest side toward Chapultepec, where the water was too shallow. The small boats engaged in ordinary traffic sailed everywhere, however, not only on Tezcuco, but on the other lakes and on the connecting rivers.

Two or three generations after the Spanish conquest the condition of the City of Mexico had changed. It had ceased to be an island, the canals had become dry; and wheeled vehicles had taken the place of canoes. This result was due in part to the construction of additional dikes, but nature apparently had been the main agent in the matter. Such seems to have been the opinion of Torquemada, a monk who lived in Mexico from the middle of the sixteenth century to the beginning of the seventeenth. He says, according to Prescott (page 33), that:

As God permitted the waters which had once covered the whole earth to subside, after mankind had been nearly exterminated for their iniquities, so He allowed the waters of the Mexican lake to subside in token of good will and reconciliation after the idolatrous races of the land had been destroyed by the Spaniards.

About the time of Torquemada's death there occurred one of the periods of high water which, at that epoch, still periodically reduced the city to a partially inundated condition. To prevent such occurrences in the future a tunnel was built to carry off the surplus water of the Cuautitlan River. It might be supposed that, after the construction of the tunnel, the lake would never return to its natural condition. In 1629, however, during a season of uncommonly large floods the tunnel was blocked completely. The City of Mexico was flooded for a time and was in great straits during a period of extraordinarily rainy years lasting till 1634. Thereafter it became dry once more, although neither the tunnel nor the old dikes were

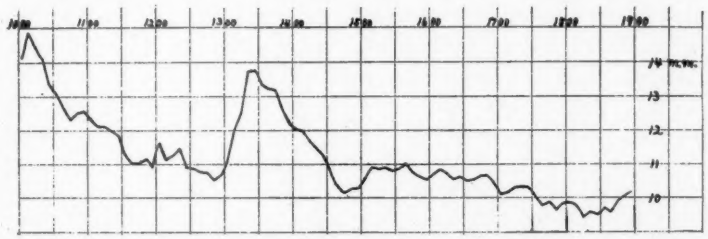

FIG. 1—Uncorrected curve of growth of the *Sequoia Gigantea* in California, based on 785 measurements. In the final curve, to which the requisite mathematical corrections have been applied, the left-hand portions will not rise quite so high as in the uncorrected curve here presented. The final corrected curve will be published in a volume entitled "The Climatic Factor" to be issued shortly by the Carnegie Institution of Washington.

in a condition to prevent the rise of the water. Again, from 1675 to about 1755, the tunnel was closed completely, being filled with earth for an unknown distance. At the same time also the dikes were in poor repair, breaking whenever the water rose higher than usual. Nevertheless, the city continued to stand on dry land. Sometimes, to be sure, a year of exceptional rains caused the water to rise sufficiently to flow into some of the streets, but not enough to do any serious damage.

Let us sum up the matter and at the same time compare the changes in Mexico with those indicated by the curves of growth of the *Sequoia Gigantea* in California and the yellow pine in New Mexico, as shown in Figures 1 and 2. It appears that about 1325 the level of the lake was high. For the next hundred years or more

we do not yet know what occurred, but about 1446 there was a special reason for beginning to build dikes. This may possibly mean that the water had fallen from its position in 1325, and now rose again, a condition opposite to that of California. A little later, toward the end of the fifteenth century the water stood much lower than formerly, but rose again so that in 1520 the city was completely surrounded. This fluctuation, unlike its predecessor, appears on the whole to agree with the climatic tendencies of the same period in California as indicated by the curve of the Big Trees (Fig. 1). None of the other trees for which data are available furnish climatic curves of any accuracy going back as far as 1300, and neither this curve nor any other indicates the state of affairs in a region at all resembling southern Mexico climatically. Hence we make use of the curve of the sequoias merely as a suggestion of the method to be employed in future work. Mexico City in latitude 19° N. and the Sierra Nevadas 1,600 miles away in latitude 37° are so far apart and the difference between the equatorial summer rains of the southern region and the sub-tropical winter rains of the northern is so great that any marked agreement between the two is not to be expected. Nevertheless the high stand of the water of Tezcuco in the first half of the fourteenth century and its low stand toward the end of the fifteenth century agree distinctly with the fluctuations in the growth of the trees. From 1600 A. D. onward we are able to compare the changes in the city of Mexico with those in the state of New Mexico, a region which is not only not quite so remote as California, but which also receives part of its moisture from summer rains of the same type as those prevalent in southern Mexico. The New Mexican changes are indicated in Figure 2, the curve of growth of the yellow pine. About 1600 A. D., near the time of Torquemada's death, the country around Mexico City was comparatively dry, but a little later the lake rose, reaching an especially high level from 1629 to 1634. In New Mexico much the same thing took place, except that the moist period seems to have culminated somewhat later. At a still more recent period, from about 1675 to 1755, relatively dry conditions prevailed, both in the City of Mexico and in New Mexico. Since that time the increasing number of canals makes it impossible to judge of the climate from fluctuations of the lakes, but the data for the preceding years are at least enough to prove suggestive. The essential point of the whole matter is that the evidence so far as it goes appears to indicate that the enclosed lakes of Mexico have been subject to rather pronounced fluctuations lasting for many years and

agreeing in a general way with those of other parts of the world, either farther to the north in America or in the distant regions of the eastern hemisphere. On the whole, the climate from 300 to 600 years ago seems to have been moister than that of to-day, although certain periods such as the end of the fifteenth century may have been dry.

The evidence just presented is in itself too slight to justify us in accepting any conclusion derived from it alone. Nor is that which follows any more conclusive. At present, however, our purpose is merely to test a theory whose basis has been elaborated in previous publications. The most rigid test is to see if the theory can stand

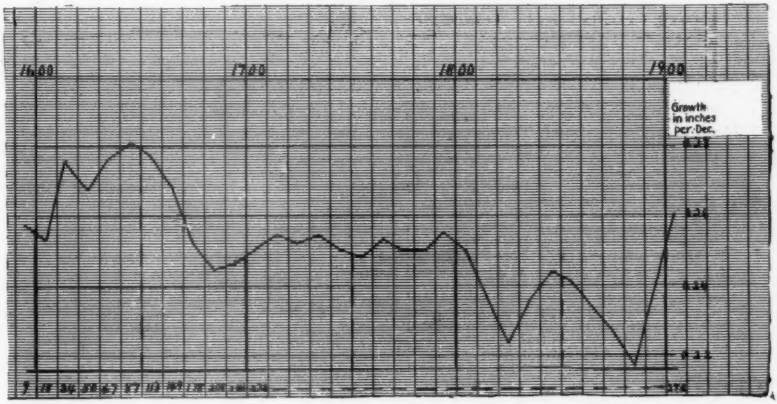

FIG. 2—Curve of growth of the yellow pine in New Mexico, deduced from measurements made by the U. S. Forest Service. (Numerals 19, 18, 34, etc., indicate number of trees used.) "Dec." in upper right-hand corner stands for "decade."

when applied to places and conditions far removed from those under which it was framed. Thus we select as many tests as possible in Mexico, but must recognize that in themselves they are not sufficient to form the basis of a broad theory. If the lakes of Mexico have fluctuated in size, the deposits of the surrounding plains ought to show corresponding variations. Fortunately, Mr. Manuel Gamio, under the direction of Professor Franz Boas, has recently been engaged in archæological excavations on behalf of the International School of American Archæology and Ethnology, and has done some work which is significant for our present purpose. The hamlet of San Miguel Amantala near the village of Azcapotzalco lies on the edge of the lacustrine plain of the City of Mexico not far from the base

of the hills on the west. This portion of the plain is dotted with little mounds which mark the sites of villages or small groups of houses built by the Aztecs and full of the typical pottery, images and other relics of that people. Elsewhere the plain is strewn with the scattered fragments of another and older type of civilization which is known as that of San Juan Teotihuacan from the great pyramids of that name on the eastern border of the basin of Mexico. The San Juan relics never occur in mounds of the Aztec type except for a few stray bits which have been carried in by accident. This indicates that the two are of distinctly different dates, as indeed we know from other evidence. Some of the mounds of Aztec age appear to be merely accumulations of earth from the adobe roofs and walls of the ancient dwellings but others appear to have been built of set purpose. This suggests that for some reason the earlier people built their houses directly upon the plain, while the later Aztecs raised theirs upon mounds. To Professor Boas this fact seems to indicate merely that before coming to the Mexican plateau the Aztecs had probably acquired the habit of building elevated structures and that this persisted throughout their history. Possibly, however, the elevation was an advantage for purposes of defence; or perhaps, at the coming of the Aztecs, the level of the lakes was so high that in times of unusual rain the villages were occasionally in danger of inundation, although during the days of their predecessors, the San Juan people, the plain may have been so dry that no such danger existed.

In one of the sites marked by San Juan pottery Professor Boas has made an excavation in which he finds the following section from the top downward:

(A) 1 or 2 feet of fine, dark surface soil full of bits of San Juan pottery.

(B) 6 inches to two feet of "tepetate", or "caliche" as it is called farther north, in layers from one inch to one foot in thickness. It is mixed with bits of San Juan pottery and is interstratified with layers of well-rounded gravel containing pebbles up to two or three inches in diameter. The "tepetate" is a white calcareous deposit which is frequently formed in dry regions where a large amount of water evaporates. It is usually considered characteristic of rather arid conditions. Here at Azcapotzalco it is frequently faulted a few inches as if the ground had sunken a little.

(C) 4 or 5 feet of "culture layers" full of San Juan pottery intermingled with ashes, fireplaces, and the foundations of ancient houses.

(D) 5 or 6 feet of fine sand, often in pockets or in slightly cross-bedded bands. This is intermixed with finer sandy materials and a certain amount of clay like that which forms the bulk of the overlying culture layers. Fragments of pottery of the same San Juan type, together with bones and angular stones

as much as a foot in diameter, indicate that men lived here when the layers were being laid down, although there are no foundations.

(E) 11 or 12 feet of gravel and sand growing coarser downward, and at the base containing cobblestones a foot in diameter. The pebbles are mostly well-rounded as if they had been carried far in running water, although a few angular pieces are found, especially in the more clayey portions of the sand. San Juan pottery occupies the upper five or six feet, but only in small quantities. The fragments are often angular, showing that they have not been carried far in running water. The lower five or six feet contain quite a different type of pottery, belonging apparently to the type which Professor Boas has called the Mountain culture. It is much more archaic than the San Juan or Aztec types, and it is certainly older, since it lies lower. Whether it persisted until the time of the later cultures we cannot tell. Professor Boas says that as yet it has nowhere been found on the surface of the plain, although it is common in small areas scattered among the surrounding mountains. Hence its name. The pieces found by Professor Boas in his excavations were all well rounded, showing that they had been carried some distance by running water, or in other words, that they had been brought in from the mountains.

At a short distance from the main excavation Professor Boas found that the gravels of this formation die out. Minor excavations in several places led him to conclude that the main gravel just described indicates the location of a river bed less than a hundred meters wide and extending in a north and south direction. Outside the river bed, but at the same level, the coarseness of the decomposed tufaceous matter increases a little, and the material is more sandy than above or below, indicating sorting by moving water. In the sandy material the archaic pottery of the Mountain culture is found in large amounts. It is not stream-worn or rounded, and the paints with which it is decorated are still fresh. Clearly it has not been carried far, which indicates that the plain near the old river, or torrent, must have been inhabited. Whether this pottery is of the same age as the worn fragments in the river bed is uncertain. It may be younger, for Professor Boas thinks that there was a gradual transition from the Mountain culture to that of Teotihuacan.

(F) At the base of the gravels a dark, compact clay is found to a depth of about 7 feet. It contains almost no sand, but is full of plant remains, and of hydrated iron which stains it yellow. The formation looks like the deposit of a swamp or of the edge of a lake. It is sharply separated from the overlying gravel in a way to suggest a drying up of the swamp and a sudden bringing in of materials by streams which had formerly had their mouths nearer the mountains. So far as the clays have yet been studied they contain no pottery or other evidences of human occupation.

(G) Finally, the lowest formation thus far penetrated is a light-colored sand which Professor Boas thinks to be lacustrine.

The single section here given is of course inconclusive. The transition from one type of deposits to another may have arisen from a change in the course of streams by reason of an earthquake or volcanic eruption, or it may have been due to a tilting of that par-

ticular portion of the earth's crust. Nevertheless, it is interesting to see how closely it agrees with what would be expected if the climate of Mexico has varied in harmony with what seems to have been the case in other parts of the world. The apparently lacustrine deposits of G, and the swampy deposits of F, to begin with the oldest formation, suggest conditions of decided moisture with such an expansion of the lakes that the floor of the basin was uninhabitable and the people were forced to live in the surrounding hills where they developed their Mountain culture. The succeeding gravels suggest a change to drier conditions whereby the shore of the swamp or lake retreated and streams began to encroach upon the old water-covered bed. At the same time the death of vegetation upon the mountain slopes because of the aridity would permit the floods to wash down large amounts of coarse gravel, with which would be mingled rounded, waterworn bits of pottery from the mountain villages, as appears in the lower part of formation E. During this dry time, if such it really were, the people of the Mountain type apparently came down to the plain as is indicated by the unworn pottery at the base of formation E in the portions of that formation outside the river channel. A little later, the San Juan culture, perhaps that of an invader, makes its appearance close to the base of the mountains at first, or on the very edge of the plain as indicated by the fact that it is present in the gravels, but is free from marks of wear by running water. By the time deposit D began to be laid down the San Juan people were living not far from the site of the excavations. When C was being formed conditions were very much as now. B, on the contrary, with its layers of "tepetate" and gravel suggests a return toward aridity, while A brings us back to the present conditions. If the elevation of the Aztec mounds, built since the deposition of A, really has anything to do with the danger of flooding, it may indicate a slightly moister time such as that of which the traditions give a suggestion in the fourteenth century, while now in the nineteenth and twentieth centuries we are back once more in dry times. The whole importance of the line of reasoning here followed is quite independent of the fact that the specific phenomena described above are subject to other possible explanations. It lies rather in the fact that the explanation here offered harmonizes with a vast number of other facts both in Mexico and elsewhere and genuinely explains them, while the other explanations take little account of anything outside of the narrow range of the phenomena immediately under consideration.

One of the important methods of testing the theory here sug-

gested is the occurrence or non-occurrence of the type of terraces which seem to be of climatic origin. I have discussed this matter at length in "Explorations in Turkestan" so far as it applies to Asia, and shall discuss it further in respect to America in a forthcoming report to be published by the Carnegie Institution. Here it must suffice to say that in both Asia and America the drier, more rugged mountains of non-glaciated sub-tropical regions are full of alluvial terraces composed of gravel and silt, and ranging in height from ephemeral ones five feet in height to enduring ones a thousand feet high. Generally the terraces are more than one in number and in practically all cases where they are well developed there are four or five. They are of such a nature, and are so located in interlocking valleys on all sides of the mountains that they can scarcely be due to movements of the earth's crust, unless we make the impossible assumption that the crust moved in such a way as to steepen all valleys at one time and flatten them at another no matter what their direction. The only other process yet suggested which adequately explains the terraces is climatic variations causing the rate of erosion and weathering as well as the volume and velocity of the streams to change.

Terraces of the kind here considered seem not to have been described by the geologists of Mexico, but when I inquired about them I was told that they are abundant in the states of Chihuahua, Durango and elsewhere in the northwest. I had previously seen them in large numbers and in a highly developed condition in Sonora, the extreme northwestern portion of Mexico, and also along the portion of the railway line from Laredo to the City of Mexico in the vicinity of Monterey in the northeast. Through the courtesy of Dr. José G. Aguilera, Director of the Geological Institute of Mexico, one of his assistants, Mr. Ygnacio S. Bonillas, was permitted to spend some days with me in studying the region around the City of Mexico. Thanks to Mr. Bonillas's thorough knowledge of the local geology I was able in a short time to see things which it would have taken me weeks to find alone. He took me out to the northwest of the city where the volcanic hills are deeply seamed with rugged ravines descending from high mountains. There in four valleys we found terraces of the kind under discussion. The presence of revolutionists within three or four miles of the places where we were at work prevented us from examining others or from following any of the four up into the mountains where the maximum development is to be expected. Nevertheless, the places shown by Mr. Bonillas were sufficient to suggest that valleys which are of sufficient size and which

come from mountains of sufficient height and youth, contain alluvial terraces of the type which elsewhere seems to be climatic. In various places the cross section of the valleys is like that shown in Figure 3. The calcareous "caliche" or "tepetate" (2) on the top of the main volcanic deposits (1) suggests a long dry epoch. The rapid cutting to form the gorge A, indicates either a pronounced uplift, or a period of comparative moisture during which the streams were able to erode rapidly, either because of their large volume or because they were lightly loaded with detritus by reason of the covering of the slopes with vegetation. The alluvial filling 3, indicates either a tilting of the earth's crust back toward its original position, or a period of aridity during which the streams diminished in size and gained a heavier load because of the death of vegetation. The same process of cutting and filling was repeated at least twice,

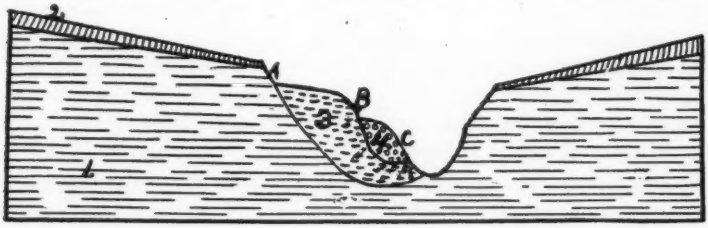

FIG. 3—Cross section of alluvial terraces in a typical valley among the volcanic hills near the City of Mexico. 1 = volcanic tuff. 2 = "caliche." 3 and 4 = first and second alluvial deposits of gravel and sand. A, B, and C = successive gorges.

and possibly several times, although the evidence is now concealed or has been worn away. Similar phenomena on a much larger scale occur farther south, especially in the valley of the Papaloapan River nearly 200 miles southwest of Mexico City between Pueblo and Oaxaca. Here the terraces reach a height of at least 200 or 300 feet, and are developed to the number of four over long distances. They are apparently of the same type as those in regions hundreds and thousands of miles away, and appear to be due to a common cause which can scarcely be anything but climatic pulsations. The constant occurrence of such terraces from Utah on the north through Mexico to the far south of that country, and their high development even at the southern limit to which they have yet been traced seem to be strong indications that whatever climatic changes have taken place in the United States have also taken place in Mexico, although the phases of change may have differed in the two places.

(*To be concluded.*)

THE DWARF FORESTS OF SOUTHERN CALIFORNIA

By ISAIAH BOWMAN

(Map facing p. 16.)

The terms "dwarf forest," "elfin-forest," and "chaparral" are used to designate a type of plant formation notable for its stunted trees with gnarled trunks and boughs. It is intermediate in character, as it is in position, between the formations of forest and desert. It is distinguished from the dwarfed forests of high altitudes (where the trees diminish in size and become procumbent on account of the cold) chiefly by a marked difference in the kinds of plants. Instead of having dwarfed specimens of trees from the neighboring forests, we have distinct genera. In California these are chiefly *Adenostoma, Arctostaphylos, Artemisia, Ceanothus, Eriodictyon, Quercus, Rhus, Ribes,* and *Yucca.* The total extent of true elfin forest is not large, and in the United States it is found only in southern California, where its influence on evaporation and water supply is so important that it has been the subject of special study by the Forest Service. The results are embodied in Bulletin 85, by F. G. Plummer, Geographer. This is the first publication dealing exclusively with chaparral, and since the conclusions are of great interest to geographers it seems desirable to present a brief account of them to a larger circle of readers.

From the profile of forest zones on the Pacific Coast (Fig. 1), it is seen that the range of the chaparral zone of California and Mexico is from 27° to 37° north latitude, and from sea level to 8,000 feet. Its most striking development is in the middle subzone, from 2,000 to 5,000 feet, where 95 out of 116 distinctive species grow. Of these 38 occur only in the middle subzone.

The restricted development of this forest type at once directs attention to the special climatic features of the region. Both Schimper and Warming explain the type by the highly restricted combination of a winter (low temperature) season with a marked though not abundant rainfall and a hot and nearly rainless summer. Thus in the northern part of the chaparral region of California only about 3 per cent. of the scanty rainfall occurs in the summer season and in the central and southern parts less than 1 per cent. A second feature is the orientation of the main range, the Sierra Madre (a group name which includes the San Gabriel, San Bernardino and

San Raphael Ranges), which trends eastward from the coast, or *down* the westerly winds. The rain-bearing winds pass freely through the low passes on either side and are not forced over the mountains to any considerable degree. The result is a drier mountain climate than in the Sierra Nevada on the north or the San Jacinto on the south. It is therefore in the Sierra Madre that the chaparral has its best development.

In the chaparral area the wet-winter and dry-summer climate reverses the ordinary habits of plants. The distinctive species make most of their growth in winter and are then green, in contrast to their brown, lifeless summer appearance. The distribution of the rainfall varies with the altitude, increasing at the rate of 0.6 inch for each 100 feet of rise. Along the coast the mean annual rainfall is thirteen inches, insufficient to support even a dwarf forest except

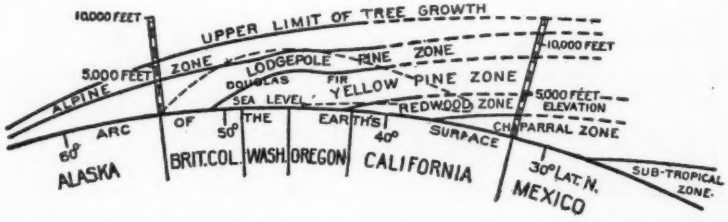

FIG. 1—Forest zones of the Pacific Slope. (Reproduced from Fig. 1, Bull. 85, U. S. Forest Service.)

for scattered tracts of oak woodland. At 2,000 feet the dwarf forest begins in its most characteristic phases and at 8,000 feet is displaced by the normal forest of the belt of high precipitations.

The dependence of the mild climate upon the westerly ocean winds is strikingly brought out when, at long intervals, the hot northern or eastern desert wind—the so-called "Santa Ana"—reaches the coast, or when the southern storms, or "Sonoras," begin to blow. The high mountains near the low-latitude coast bring about a well-nigh tropical compression of climatic belts. "One may, sandaled and hatless, pick an orange or a fig while gazing at snow-capped hills" (p. 14). The sea fauna is likewise varied and includes both the Behring seal and whale and tropic goldfish and sea turtles.

Throughout dry southern California water is of the utmost importance for irrigation and municipal supplies. In fact the future population of the region will be limited only by the amount of water which can be made available. It is in its relation to the water-supply that chaparral is chiefly important. It conserves the moisture and

regulates the flow of the streams (1) through its roots which assist percolation and prevent erosion, and (2) through a reduction of the rate of evaporation by breaking the force of the hot winds and by shading the ground. These beneficial effects have not been quantitatively determined, but their truth has been established by the well-known effects of grazing, burning, and clearing, upon both springs and streams.

The density and composition of the chaparral vary with the elevation. In the Pasadena watershed 84 per cent. of the surface is shaded on the northern slopes between 2,000 and 3,000 feet, while

FIG. 2—Northern end of Santa Ana Mountains showing good cover of old chaparral undamaged by fire. (Reproduced from Fig. 1, Pl. v, Bull. 85, U. S. Forest Service.)

only 57 per cent. is shaded at the same elevation on the southern slopes. The corresponding figures for the Santa Ana watershed are 64 per cent. and 39 per cent. Between 3,000 and 5,000 feet the percentages are about equal in both cases. It is well known that the San Bernardino Range is a fault block with steep bordering escarpments and a rather smooth summit. An examination of the detailed tables on pages 27-28 of Bulletin 85 appear to show that the chaparral growth is distinctly thinner on the bordering dissected scarps than on the smoother upper or lower slopes. The contrast in density between northern and southern slopes is explained by the

contrast in temperatures and its effect on reproduction. Fire is about the only agency which tends to limit the density of the chaparral in protected situations. In northerly slopes fires do little permanent damage; the chaparral soon regains possession. On southerly slopes the soil is drier, the growth is poor and scattered, and the fire-baked ground is inhospitable to the forest pioneers.

The limited commercial use of chaparral is the natural result of its dwarfed and twisted growth. During the early settlement of southern California, and before coal and lumber were imported, it furnished a part of the fuel supply. In recent years the demand from this source has practically ceased. Some species are used for fencing, and the Indians at one time gathered the nuts of others for food. A few species have medicinal value. In time of drought cattle browse on chaparral; sheep can do fairly well, but their wool prevents them from penetrating the denser stands; while goats thrive on it. It was the custom in the early days for the cattlemen to set fire to the chaparral in the belief that it would make way ultimately for better forage; prospectors burned over the areas they were about to explore, and hunters drove out game by the same means. These practices have virtually ceased with better laws based on larger experience and the necessity for carefully conserving the water supply. Bee culture is an established industry in the chaparral area, since there is scarcely a time of year when at least some species do not furnish the necessary supplies. About 700 tons of honey are produced annually.

It is concluded that the present distribution of normal forest and chaparral represent a natural balance between two contesting plant formations. It follows that the restocking of burned or cleared areas in the chaparral zone with native forest species of economic value would be attended with very limited success. Among exotic species, better adapted to the soil and the climate and at the same time affording adequate cover and commercial timber, the most promising are the eucalypts of Australia and Tasmania. About 100 species are now grown in various parts of California, Arizona, Texas, and New Mexico, but none can endure very cold weather, the extremes for the hardiest species ranging from 10° to 18° F. It is estimated that about 1,000,000 acres of the chaparral area would support a growth of the most desirable species of eucalypts and that on another 1,000,000 acres more hardy but less valuable species could be grown. It is doubted, however, if the expense of such planting should be entailed until a larger number of species and habitats have been tested experimentally.


122° W
121°
120°
119°
Monterey
Pt. Sur
King River
Salinas River
INTRAMONTANE REGION
Porterville
Tulare Lake
Bakersfield
San Luis Obispo
CARRIZO PLAIN
Buena Vista Lake
Kern Lake
KURO SIWO
JAPAN CURRENT
Santa Ynez R.
Pt. Conception
Santa Barbara
Ventura
San Miguel I.
Santa Cruz I.
Santa Rosa I.
TROPICAL
Sta. Barbara I.
San Nicolas I.
San Clemente
35°
34°
33°
MAP OF
THE CHAPARRAL REGION
OF
SOUTHERN CALIFORNIA
Based on Pl. VIII, Bull. 85, Forest Service
Scale 1:2 700 000
0 10 20 30 40 50 MILES
Chaparral
Timberland and Woodland


119°
118°
117°
116°
Owens Lake
DEATH VALLEY
NEVADA
CALIFORNIA
35°
ULTRA MONTANE
Mohave R.
MOHAVE DESERT REGION
34°
San Bernardino
Los Angeles
Santa Ana R.
Pt. Fermin
Santa Catalina I.
CURRENT
San Clemente I.
San Diego
Pt. Loma
CAL.
MEXICO
33°

MISCONCEPTIONS ABOUT LIFE IN THE ARCTIC*

By VILHJÁLMUR STEFÁNSSON

The Cold. There is a common belief that Arctic travelers are the best authorities on the effects and accompanying phenomena of extreme cold. This idea obtains partly through the fact that travelers far north write books about their experiences, and partly through a hazy understanding of the physical truth that, *other things being equal,* the farther towards the pole one goes the lower becomes the average temperature of the year. But altitude and the presence or absence of large bodies of water are about as important factors as latitude in determining temperature; all of us know this well enough in a general way, but the thinking habits of ancestors who did not know it are so strong upon us that few of us make actual use of that knowledge when we meet such phrases as "arctic storm" and "polar night"—phrases charged with the intense meaning that remoteness and ignorance combine to give.

The Meteorological Service of Canada has regular observers, among other places, in Manitoba and at Herschel Island. Manitoba is an agricultural province with cities having populations in the second hundred thousand and with a climate allowing successful grain-farming wherever the soil is suitable. Herschel Island is a whalemen's rendezvous about a thousand miles farther north; its only permanent inhabitants are Eskimos; it lies on the north coast of our continent far out of the way of any warm current of either the Atlantic or Pacific, and yet for ten years its temperature has never fallen as low as the lowest record in Manitoba—and this measured with instruments of the same sort, made by the same maker and tested and carefully compared with the same standard in Toronto. Up to May, 1908, the lowest recorded temperature for Herschel Island was —54° (F.), for Manitoba —55° (F.). And yet the Manitoba cold seldom prevents the young people of the farms from riding in singing sledfuls to dances six or ten miles away—clad, too, in clothing inferior to that worn by the poorest Eskimo in similar temperatures and

* Written during the first winter of the expedition, undertaken under the auspices of the American Museum of Natural History and the Geological Survey of Canada, from which Mr. Stefánsson recently returned; dated Point Barrow, Alaska, February 12, 1909. For other general articles on the Arctic by the same author, see the *Bulletin*, Vol. 44, 1912, pp. 340–347, and Vol. 40, 1908, pp. 210–213.

under similar conditions. If we should grant, then, that the people born in Manitoba and the people who have settled the province, are presumably as intelligent as the Englishmen, Italians, Norwegians and others who go on polar voyages, why do we have shelves full of the horrors of Arctic cold and not a pamphlet on the horrors of Winnipeg in February? It may be partly because Canadians do not like to scare off prospective immigrants, but it is more largely that the terrors of "fifty below" are not so impressive when we have the companion picture of little girls toddling to school and the traffic of city streets uninterrupted.

Who should be the better judge of the real character of "fifty below," the man who goes through a winter of it with the mentally superinduced shivers of one who knows from his previous reading and the forebodings of his friends at home that he must be undergoing woeful hardships, or the man whose chief concern at a drop from "thirty below" to "fifty below" is the slight increase in his fuel bill?

It is true that a tourist often writes more interestingly about a place than can its oldest inhabitant. Arctic literature is interesting enough; the trouble with it is its inaccuracy and exaggeration. An Eskimo reporter on a New York daily might possibly write an amusing enough account of a sultry July afternoon in the tenement district, but would it be likely to be accurate? True, he would probably give his own impression truthfully; so do many writers on the Arctic. But the composition would be a document whose literary and psychological value would rather overshadow its significance in geography or meteorology. It would give a reader in Paris no very true idea of the summer climate of New York; neither do some of the documents of the Franklin Search give a strictly conservative and unimaginative account of the climate at sea level in the regions about 70° north latitude. Here and there in the body of the book you read of the terrible cold and the suffering it caused; turn to the tabulated temperatures in the appendix, and you may find "—36°" corresponding to your day of horrors. And no doubt, from a subjective point of view, it was horribly cold to a man who had grown to middle age in southern England where the skating on small ponds is safe only in a "cold" winter. A Manitoban might have forgotten to make a weather entry in his diary on a day that exhausted the Englishman's vocabulary.

Blizzards. The idea that Arctic blizzards are severe beyond belief rests on the same cornerstones as does the over-fear of Arctic

cold. The writer has no desire to class with May zephyrs the storms that sweep across our ice fields and tundras on the north coast in February and March; however, in two winters north of the Arctic Circle he has not seen a storm that quite equaled any one of half a dozen blizzards remembered from twenty years in North Dakota and Manitoba. True, a blizzard of the first rank does not sweep the Dakotas every year or yet every two years; so it may be pointed out that two winters in the Arctic is not time enough to form an opinion. But I have been in storms which Eskimo companions have told me were as severe as any they ever experienced, and in the worst of them I could have distinguished a man ten feet away at least three-fourths of the time. In some Dakota blizzards there is simply no way of keeping the eyes open—they fill with snow the moment they are opened wide, and if one tries to look through the protection of the eyelashes too much light is shut off even before the snow cakes in them and shuts the eyes. On our ranch in north-eastern Ramsey County, North Dakota, we had a smooth wire stretched from the house door to the barn to help us find the way in case of blizzards. On a certain Thanksgiving Day which most Dakotans of that time still remember, I followed that wire to the barn. Several times on the way I had to stop and hold both hands over my nose and mouth, for I could not draw my breath otherwise; I did this stooping over the wire, for I did not dare let go of it. I walked with both eyes tightly closed and felt ahead with my feet each time I stepped so I should not collide too forcibly with the barn. With automobile goggles over the eyes I could doubtless have caught glimpses of the barn now and then after getting within fifteen feet or so of it, but though I stopped and opened my eyes momentarily every four or five steps I did not see the wall till my toe touched it.

This description is from the recollections of my teens; with my present experience to draw on the storm might possibly not impress me so much. Nevertheless, it is my judgment that the worst Arctic storm I have seen must have lagged in velocity eight or ten miles per hour behind that Thanksgiving blizzard and must have lacked a good many snow particles per cubic foot of being as thick. And yet my parents and our neighbors brought up large families in comfort in a country subject to such storms and such cold—just as Eskimos bring up their families in comfort and take care of their sick and their aged among similar storms at the mouth of the Mackenzie River.

It is true that blizzards of medium intensity are more frequent

at the mouth of the Mackenzie than they are in Dakota; the temperature during a blow is also on the average lower, though the worst storms I have seen have a thermometer hovering about the zero point; when the drifting snow allows you to see a man fifty feet away the thermometer may fall to 15 or 20 degrees below zero. The Arctic winter is of course longer than the Dakota winter, and the average cold of the coldest months is considerably greater, but the fact that the cold is uniform makes it no harder to bear than if it were fluctuating—at least that is the opinion of most people. Is not the changeability of the weather the endless plaint of Bostonians?

Clothing. That fur clothing is not suited for Arctic wear is a thesis of some explorers of high standing. Like many other such beliefs it has its reasons, but to the mind of the present writer there seems to be a flaw in the reasoning. The conclusion of these eminent writers should have been specific rather than general; they should have concluded that such fur clothing as their particular expedition was provided with was unsatisfactory for the particular use to which they put it; they did not have the logical right to condemn fur clothing in general because such as they had, when used as they used it, did not give satisfaction.

The summer of 1904 I happened to be in Iceland living at a boarding house in the outskirts of the city of Reykjavik. At our table were a foreign agricultural "expert" and several prominent Icelanders interested in getting new farming methods introduced into their country. One evening these men came in to dinner from a public "demonstration" of mowing machines where six machines of foreign design and one designed by an Icelander had been publicly tested on a typical Icelandic meadow. One of the machines was of American manufacture. The verdict of the judges and the opinion of my fellow diners was that the American machine was a poor machine; in connection with this the foreign "expert" took occasion to say that he had heard a good deal of blatant praise of American machinery in general, but in his opinion none of it was worth much. In this the others concurred to the extent that certainly American mowing machines were nothing to brag of. A little quiet discussion, however, brought the company to an admission of two things—first, that it was unreasonable to expect a machine made in America by men who had in mind the level meadows of the Middle West, to meet successfully the peculiar conditions found in Iceland; the machine would have to be radically modified to do that, even though it were the best possible machine for an Iowa farm. Secondly, it was

unreasonable to expect a machine to do its best under the conditions that had prevailed in the test that day—the machine had been operated by a man who did not understand it; it had been hauled around by one Icelandic pony when it was designed to be drawn by a pair of horses—for that reason it had "clogged" repeatedly, when a pair of horses walking at a good gait would have kept it from clogging.

The same argument applies in detail to most of the fur clothing to which its wearers have objected—it is made in temperate lands (such as Norway) by people who are unfamiliar with the conditions to be met by the garments they are making; secondly, there is an art of taking care of fur clothing—that a fur coat rots to pieces on a man's back in a week is really a criticism of the man, not the coat, though the coat usually gets the blame. The whole art is in keeping the garment dry or drying it when it becomes wet. Explorers of standing have said in print that this cannot be done, a conclusion with which I do not believe any man will agree who has been a member of Peary's expeditions, Amundsen's North-West Passage Expedition or Leffingwell and Mikkelsen's Arctic Expedition, or in fact of any expedition whose members have thought it worth their while to see how the Eskimos take care of their fur clothing.

The writer has had personal experience with "approved fur clothing for Arctic use" made (in Norway, or Lapland, I believe) for Scott's first Antarctic Expedition and the Leffingwell-Mikkelsen Arctic Expedition. I have been told the deerskin clothing of both these expeditions was made under the same auspices; at any rate, it was substantially similar in character. It is easy to understand how an explorer whose experience was confined to such fur clothing should conclude it unsuited to Arctic use—or, indeed, to any use whatever except that of exhibition as curiosities. A description of a typical garment—a coat given me by Captain Mikkelsen—will suffice.

The coat was made of deerskin whose thickness and length of fur leads me to think it was taken from an old male deer during, say, the month of November. The skin was so thick that the coat would almost stand alone on the floor; it was so stiff that when one had it on it took considerable muscular effort to bend the arm to a right angle at the elbow; when one allowed the arms to hang naturally they stuck out from the body approximately at an angle of 35 or 40 degrees. The coat was open in front, from the neck down, some ten or twelve inches and even when buttoned up allowed the wind to blow in; when the garment had once been put on I could not get it

off without help although it was several "sizes" too large for me. On a spring balance (which may indeed not have been accurate), the coat weighed over ten pounds, or about as much as a complete double suit of inner and outer garments of well-made Eskimo fur clothing suitable for any winter weather.

As a contrast to the above "approved" Arctic fur coat, take a coat such as is worn by the Eskimos of the north coast of America. To begin with, Eskimos use the skins of old male caribou only for boot soles or for floor covering in their dwellings; those for garments are taken in summer, while the hair is short, from young deer—fawns and yearlings preferably. They are scraped into the softness of chamois with stone (or iron) scrapers and sewed into clothes that fit as loosely as our summer suits. The coat is put on after the manner of a sweater and hangs loose everywhere except that its hood fits snugly around the face (over the head, in front of the ears and under the chin). The coat I am wearing this winter weighs 3½ pounds, and I have another (a trifle too light for an outer garment and intended for an undershirt) that weighs 2¾ pounds. My 3½ pound coat is actually a warmer garment than the heavy European coat described above, is soft as velvet and in good condition after six months' wear and nine hundred miles of winter travel. I have seen complete Eskimo winter suits consisting of one pair of socks, one pair of boots, one pair of drawers, one pair of trousers, one undershirt, one coat, two pairs of mittens—all of deerskin—that weigh only 10 pounds in all and yet are warm enough to keep a man comfortable all day in such cold occupations as sitting on a snow block fishing with a hook through a hole in the ice at 40° below zero. Now that deer are getting scarcer on this part of the coast, however, the Eskimos are forced to use skins they would not have considered fit for clothing a few years ago—and still I do not think I have as yet seen a suit that would weigh as much as the combined weight of one coat and one shirt of the "approved Arctic clothing." It goes without saying that the Leffingwell-Mikkelsen Expedition discarded their European clothing as soon as they came into contact with the superior Eskimo garments; the British Antarctic Expedition naturally had to use theirs or fall back on woolens in the unpeopled lands to which they had gone.

As to the suitability of woolens for Arctic wear: There have been few expeditions fitted out with such care in every way as was Roald Amundsen's *Gjöa* Expedition, and the finest woolen coats and underwear I had ever seen were the (Danish?) garments used by them. From my own experience with a coat from that expedition

which came into my hands and which I used occasionally during the winter of 1906-7 there is this to say: I suppose the Scandinavian "vadmal" coat would be as fit for service after three years as a deerskin coat is after one, but the woolen coat is double the weight of an average deerskin one and not more than half as warm. It makes a good coat in calm weather, but the wind penetrates it easily. While it forms a good emergency garment there is little doubt that any future ventures of Capt. Amundsen's will depend chiefly upon garments of the Eskimo type. I have heard that the *Gjöa* had some wolfskin clothing that was quite satisfactory for winter use; this, when well made, doubtless forms a passable substitute for deerskins and is probably even warmer, pound for pound of weight.

Supposed Wretchedness of the Eskimo's Life. That life in the Arctic is typically wretched is one of the cherished beliefs in southern lands. True, we have no metropolitan affluence up here, but one who knows where to look for misery in New York can find more want of food and raiment, more of the evils resulting from dirt and foul air, within fifteen minutes' walk of Broadway than he can in fifteen hundred miles eastward along the coast from Point Hope, Alaska.

That the cold up here makes life wretched might be considered refuted by a previous paragraph comparing the winter climate of Manitoba (where people live in admitted comfort) with that at the mouth of the Mackenzie. That life here is not wretched to those who take it unsentimentally may be further instanced by my own experience and by the fact that I know of no white man resident north of the Arctic circle who says he finds it so and that I see no sign that the Eskimos find it so. On the whole, the Eskimos are the most cheerful and contented people I have ever come into contact with. If white men occasionally express a desire to get away from the polar lands, it is not the climate, *per se,* nor the dearth or quality of food here that drives them away—it is isolation from the social life to which they are used.

There are four chief physical conditions whose presence tends to make a man the opposite of wretched—that he be well fed, well clothed, well housed and in good health. How is the Eskimo situated in regard to these? (Here, as always, it is to be understood that special reference is had to the Eskimos about the Mackenzie mouth and westward along the Alaska coast, for they are the only ones personally known to the writer.)

In the matter of food three things are necessary—that there be

enough of it, that it be wholesome, and that the man who eats the food shall consider it good food. I have heard that starvation sometimes visits the districts about Hudson Bay and the eastern Eskimo districts generally, but along the coast known to me starvation has not occurred in recent times, though it is known in the interior. Near the Mackenzie mouth there has certainly been no famine during the last 75 years—which is more than can be said of Ireland, a country nevertheless popularly considered fit for human habitation.

There is every reason to consider a winter spent by the writer (1906-7) in an Eskimo family near the Mackenzie delta typical of winters there in general. We had plenty of food for men and dogs; that the food was healthful was pretty well shown in that I gained in weight 20 pounds during the winter; the food was palatable, for after I got used to it I had a good appetite for every meal.

That the Eskimos are well clothed is becoming generally known since Peary had the good sense to adopt their clothing *in toto* in preference to all other garments for winter use and since gold discoveries on the Alaskan tundra have brought fortune hunters into contact with Eskimo life and Arctic winds. This clothing is so nearly cold-proof that the weather is seldom a source of serious discomfort to an Eskimo; and he takes as much satisfaction in a suit well made out of good skins as we do in the best tailoring. He is therefore from his own point of view (and what else matters?) as well dressed as we can possibly be.

As for the Eskimo's house, it is admittedly warm and in that sense comfortable, but it is currently supposed to be ill ventilated, ill smelling and filthy. I have yet to see, however, an Eskimo dwelling without distinct provision for ventilation (with the exception of houses built within the last ten years in imitation of white men's houses at Herschel Island, Point Barrow, Cape Smythe and Wainwright Inlet, presumably also farther west wherever the "civilizer" has been at work). Whether the house be of snow or of wood and earth the door is never closed, and there is somewhere in the roof a hole 2½ to 5 inches in diameter open night and day. Where the lamps keep the dwelling (as they usually do) at a temperature of 70° to 85° (F.) it will be seen that in cold weather this ventilation is ample, for the difference between —40° outdoors and +75° indoors creates a forced draft through the ventilator that keeps the air of the house always fresh.

As to the house being ill smelling, that is a matter of taste in smells. Sometimes an Eskimo house is as free from odor as a cleanly

New England farmhouse; sometimes, again, it smells of rancid oil, and meat or fish that might fairly be styled putrid. This is especially the case at mealtimes (the rancid oil is used for food, the fresh blubber for the lamps, so the lamps seldom smell). But does not the white man's house smell as strongly now and then of broiling bacon, fried onions and the like? As to cleanliness I may say that in more than half the Eskimo houses known to me the floor is kept scrupulously clean. It is the uniform opinion of the three white men who have lived at Point Barrow over twenty years that before the people there became "civilized" they all tried to keep their floors clean. They may not go to the extremes of Irving's Dutch housewives, but many of their houses are very tidy. Many of them scrub their bodies from top to toe several times during a winter.

In the matter of health the Eskimo is well off or badly, according to the point of view. The biological "evolution against disease" theory is probably well enough established; at any rate, it explains the fact that Eskimos apparently in robust health die like flies in epidemics of measles and other diseases which have long ago slain their ten thousand among the white peoples and have left among us only the immune and the descendants of the immune. Consumption also is prevalent, but not much more so than among us and not so prevalent as among many Indian tribes, say the Athabascans of central Canada.

Thus ends a rather lengthy attempt to prove the Eskimos a non-wretched people—on the whole perhaps a bootless task, for if a people behave as if they were happy, think they are well off and say they are content, what need we any further witness? Even the men who heap adjectives highest in describing the "squalor" of the Eskimo, agree that they are happy in spite of it all. It does indeed seem strange to the typical British naval officer how anyone can be happy under conditions so un-English; most of the literature of the Franklin Search admits the fact, however, though it seldom forgets to comment on its strangeness.

Several Misconceptions. Certain incorrect notions in regard to the Arctic are entitled to as lenient a term as beliefs, others are more properly denominated superstitions. Some notions of this latter class are held even by people of some experience with life in cold countries. It may seem a bit presumptous to discuss under the head of "superstitions" (as the writer intends to do) opinions of men of considerable eminence who have "been there and tried it." But is "He has done it, he ought to know" really a formidable argument?

If it were, who would doubt that planting potatoes in the dark of the moon has an influence on their future growth—for have not countless farmers done it and testified to it for centuries? After all, what one means when he says that a thing *is* a superstition is really that *he believes it to be* a superstition. The writer has in his own mind classed the following (among others) as superstitions, to wit:

(a) That one should be "hardened" to endure cold.

(b) That in cold sleeping quarters one should sleep with his clothes on (even when one has such satisfactory gear as deerskin sleeping bags).

(c) That it is necessarily dangerous and reprehensible to eat snow when one is thirsty.

(d) That snow should be rubbed on frost bites to thaw them out.

(a) *Hardening Against Cold.* Hardening one's self to cold is universally a fetich among peoples of North-European descent; how far beyond that sphere its influence goes I do not know—perhaps it is of well-nigh world-wide range. To know the belief counts so many adherents would be disheartening to one holding a brief against it if he could not take courage from such colossal downfalls as those of the lunar influences on vegetable growth and the equinoctial storms.

The main aids to hardening one's self to cold are said to be to live in as cold a house as one can endure (thus are we to accumulate grace for living in houses still colder) and to dress as lightly as is consistent with holding body and soul together. These "principles" I had heard with endless changes from childhood; I had had my eyes on the flat contradiction of them not a short time before those eyes were able to impress on my mind even a faint suspicion that my ears had lent themselves to deceivers.

Perhaps I can in no way put the case more strongly than by comparing two peoples near each other, one of which does all things that should "harden" a man and the other of which pampers itself as much as it can: the Loucheux Indians and the Mackenzie River Eskimo. With these peoples the seasons are about the same in length and differ chiefly in this, that the winters on the coast have frequent winds and the minimum temperature there is from —50° to —54° in different years; inland blizzards are rare or unknown, but the thermometer occasionally falls to —70°, so that it may be said roughly that the winters are about equally severe, for the storms of one district offset the cold of the other.

The Indians live all winter in tents. Whatever their custom formerly was, they now use factory-made white men's clothes to a

considerable extent and sleep with woolen blankets at night. These are things that should harden them, by theory. The people, however, are sickly in appearance and their death rate from consumption is greater than that of their neighbors, the Eskimos. (It must be said, however, that of recent years many of them have a sort of "town house" at the trading posts in which they live several months of each year, and it is these that are the probable breeding places and storehouses from season to season of the tuberculosis germ.)

The Eskimos a hundred miles farther north live all winter in houses of wood and earth kept at so high a temperature that most hours of the day the sweat streams from the people that sit around within doors stripped to the waist; when they go out they are dressed in double suits of furs that keep them entirely warm all day; if they run or work hard their underclothes are often wet with perspiration at night. The children, when they go out doors, are so bundled up in furs that it is only on their faces they can feel any marked difference between weather at —15° and at —50°. Nowhere is there any effort at "hardening."

It is admittedly difficult to institute a fair and significant comparison between the effects of these differing modes of life, for it is hard to get the Eskimo away from his comfortable house and comfortable clothes, while the Indians are seldom comfortably provided in either respect. A few things are clear, however: The general health of the Eskimos is better; the Eskimo hunts and travels with indifference to the weather every month of the winter, while the Indian recognizes certain periods as "too cold to hunt"; it is the general opinion of white men who have associated with both peoples that the Eskimo is the hardier.

One set of circumstances, however, gives a pretty good idea of the hardiness of the Eskimo. In the fall, when epidemics of "colds" are prevalent, they do everything to put their one medical principle—counter irritation—into effect. When their heads begin to ache and coughs develop they sit all day stripped to the waist in tents without fire. Sometimes the men will even sit outdoors behind windbreaks, almost unclad. This, they believe, is the proper treatment for "colds." Personally I found the time very trying and shivered a good deal although fairly dressed during one of these epidemics. It was late September and the northeasters blew cold and damp off an ice-filled sea. Nevertheless I noticed none of the Eskimos apparently suffering much from the cold, and still it may be supposed their being sick "lowered their vitality" to some extent. I remember one occasion

when a woman who was coughing near by sat sewing all day at a temperature which made my hands numb from writing. I had on two woolen shirts and a woolen sweater; she had one thin linen summer shirt of mine that I had given her husband as a sort of curiosity. The shirt was not buttoned at the neck and was rolled up above one elbow.

One day in February, with the thermometer at —40° and the snow drifting a little, this same woman's husband, with bare hands, sewed a seam of forty stitches accross the sole of my deerskin boot, sitting on the snow with his back to the wind. In November at about —20° he fell through a hole in the ice and got soaked to his neck; as soon as he got out he took off every stitch of wet clothing and put on dry socks, underwear and everything. That day the wind was blowing pretty hard and the snow drifted on him when he had stripped naked, but by the time his clothes were all on there was not a sign of shivering. These things tend to show that houses at blood heat and clothes that keep out the cold need not enervate a man completely. Personally I can testify that I can go through a trying day in much better form if I have had a warm house the previous night—as these Eskimos always do in traveling, for they use snow houses. For me, at any rate, the idea of "hardening" against cold is as dead an idea as the fear of thirteen at table. The best winter traveler I ever saw had only been gone from mild-wintered England a few years—Darrell, of whom Capt. Amundsen said: "With a crew of men like him I could go to the moon." He has all the strength of a warm bringing up but none of the hysterical fear of cold that so often goes with it. Another example is the English traveler, Mr. A. H. Harrison, a man past middle age, whom I have seen support cold as well as an Eskimo of twenty. I have no means of verifying the personnel of Captain Cagni's sled party on the Italian Polar Expedition, but I fancy there was in it more than one South European accustomed to mild winters and warm summers. In the Arctic whaling fleet the dark-skinned men from the Cape Verde Islands seem about as hardy as any (at Cape Parry, during the winter of 1909-10, a native of the Samoa Islands tended his traps on days that kept his Eskimo neighbors within doors), and Matt Henson, a colored man, has been farther north than any white man except Peary.

(b) *Sleeping in Clothes.* During my entire first winter in the Arctic, although I walked and ran ahead of a sled over 2,000 miles, I almost never slept in really cold sleeping quarters, for the Eskimo

with whom I traveled built snow houses for every night and in them water seldom froze. The present winter, however, we have slept in tents, for we are among inland Eskimos who do not know how to build snow camps. Because I found that even in tents the Eskimos usually sleep naked, I made systematic experiments in sleeping dressed in various ways.

It was not necessary to try crawling into the sleeping bag with clothes filled with snow; it seemed sufficient to take the printed testimony of Nansen and others who have tried that method, so I began by sleeping inside my sleeping bag in all the clothes I had worn during the day, taking care, however, that there was no snow or damp on them. I did this three nights, on none of which the temperature in the tent dropped below —5° (F.), and on none of those nights did I sleep comfortably, for the bag had a damp, cold feeling. The skin clothes kept in a large part of the heat of the body, but some of it, of course, escaped into the bag—not enough, however, to keep the temperature inside the bag above freezing, and the moisture consequently condensed and froze on the inside of the bag almost as far down as my knees. Worse than this, a change of position inside the bag would change the temperature in different parts of it, and the moisture that froze one hour would thaw the next. At the end of three nights the bag was so wet that parts of it froze stiff, and the last night I slept thus in it was one of the least comfortable I have passed in the north. I was damp all over and awoke several times during the night, shivering.

At the end of this experiment I dried the bag thoroughly and for several nights following slept with fewer and fewer clothes on each night. To summarize briefly, the conclusion arrived at was this: The maximum amount of clothing that can without discomfort be worn inside a sleeping bag in cold weather is the greatest amount that will still allow enough heat to escape to keep the inside of the bag so far above freezing that no moisture will condense inside. I have slept stripped when the temperature fell to —15° in the tent and been comfortable all night. In the morning there was no dampness noticeable inside the bag. In practice I should say that a suit of light summer pajamas would make ideal sleeping clothes under such conditions as one meets with in Arctic winter travels (taking for granted, of course, that you know how to put up a tent that will not blow away in the night. You are better off still if you build a snow house).

(c) *Snow-Eating*. That it is, *per se*, dangerous to eat snow when

one is tired and thirsty, is a piece of traveler's wisdom that one meets at every corner when among "men of experience." I have seen only two or three men who have the courage to laugh at the bogey; I know a dozen well-known travelers who believe it so thoroughly that they have never dared try it, and I have seen many more who know yarns and yarns that set forth the woeful consequences of a lapse into snow-eating. Is it not Payer (again I draw on memory in the absence of books) who tells in his account of the discovery of Franz-Josef Land of a certain stout sailor whom they never dared take with them on sled journeys because he was a "snow-eater?"

The fear of snow-eating hovered over me from the time I left Edmonton going north down the Arctic rivers; with the summer thermometer at a hundred in the shade my fellow-travelers on the Athabasca and the Slave solemnly cautioned me on snow-eating, and a similar warning came from every third Hudson's Bay man between the Peace River and the Polar Sea.

For a month or two of medium hard winter running I practiced the abstinence that comes from fear. Up to that time it had happened that we never traveled where we could not easily reach fresh water with our ice picks. But I had learned to imitate the Eskimos pretty blindly in most things, and one day I found myself absent-mindedly chewing snow with the others. I had melted on my tongue and swallowed several mouthfuls before it occurred to me that I was falling from grace—becoming addicted to the one vice that the good Arctic traveler must avoid or become a burden on his abstemious fellows. Then for the first time I began to think over the matter. I reflected that the Eskimos should know as much of the danger involved as the friends who had cautioned me; I remembered further that when a boy out ski-running I used to eat snow myself without evil results.

Sven Hedin, I have somewhere read, once upon a time counted his pulse before taking a drink after several days on the desert without water. It must have taken a good deal more self-restraint to do that than it cost me to eat snow occasionally when my companions drank water; anyhow, making the thing definite in my own mind seemed worth it. I have eaten snow under the most trying conditions I have been fortunate enough to fall into. One day, after running 30 miles against a fairly stiff wind, part of the way across tundra where we sank through the snow crust at every other step, I ate six or seven handfuls of snow and then persuaded my companions to go ten miles farther under the plea that I would rather

travel that distance to an Eskimo house than stop to make camp. Although rather tired, as I always am after going forty miles on foot, I was in no worse form that night than my companions who drank water.

The conclusion in regard to snow-eating is this: Ice is preferable to snow because a given amount of heat gives you more water; snow or ice should be warmed in the hand or by blowing on it before being put into the mouth, for anywhere below —20° (F.) there is danger of freezing the lips and tongue; snow or ice should be melted before being swallowed or at least reduced to a mushy consistency. I have not found any evil results to follow from eating snow even unmelted (considerably below freezing), but on this point it is hard to be very positive, for it is physically difficult to eat any large quantity of snow without considerably warming it in chewing and swallowing. The one fact that dogs eat snow at any temperature all day when working hard is to my mind by itself evidence enough that the practice is not very dangerous, for I have found the feeding and care that are advisable for men to be advisable for dogs also, and *vice versa.*

(d) *Rubbing Snow on Frostbites.* Under most circumstances the fear of eating snow is merely a vain fear; the belief that snow should under all circumstances be rubbed on frostbites is a far less harmless one. The matter is not serious in England where frozen cheeks are as rare as albinism, nor yet in Massachusetts where the severity of the climate is mostly rhetorical. As to what the effect would be in the Arctic we need not call any witnesses; it is only necessary to consider the matter a moment.

Any high-school pupil can tell us what would happen if an unfrozen cheek were to be rubbed with the snow of carbon dioxide. Relying on memory alone, my recollection is that solidified CO_2 is somewhere near —75° C. This is almost twice as far below the freezing point, of course, as any snow that has been solicitously rubbed upon the cheek of a poor Arctic explorer, but the effect with CO_2 would be almost magical; it would freeze as red iron burns. I have seen bits of skin taken off damp fingers handling ice for the tea pot at —50° F. The touch of snow is not so dangerous at the same temperature on account of its lower conductivity, but the effect would differ in degree only.

Some Arctic book I have read tells, I remember, how the leader of a sled party discovered a small spot of white on "poor Mr. So-and-So's cheek." He "promptly ordered a halt" and the pitching of camp. While the tent was being put up the leader himself rubbed

the victim's cheek briskly with the palm of his mitten filled with snow, but "so intense was the cold" that "in spite of all my efforts" (save the mark!) the little spot of frost had spread over the entire cheek by the time the tent was up. With snow at —50° F. one could guarantee to have not only "the whole cheek" but the whole face frozen in twenty minutes. Besides, at that temperature, snow grinds under the sled runners like sand, so that if you could not freeze a man's face with it you could at least rub the skin off.

I think it is that sane Arctic explorer, the Swede Nordenskjöld, who remarks that the people among whom he wintered in the *Vega* did not look upon a frostbite as a very serious thing—they merely took a warm hand out of a mitten, held it for a moment over the whitening spot, and the spot was gone. It seems to have struck him as a flippant way of treating a serious thing, but even if it were not the best way of thawing a frostbite (which I believe it is) it would be the only practicable way. A man who undertakes such sled trips as Hanbury's or Peary's does not have the time to camp every time a white spot appears on cheek and nose. That was well enough in the old days when entire ships' companies kept to the house until the long days of March before they dared to leave the vessel—for in April and May frostbites should be rare. A frozen cheek or nose, if you have good mittens to keep your hands warm, need not prove more serious than the sunburn you get in a steamer chair in June. You pass a hand over your face, there is perhaps on one cheek a hard spot the size of a quarter of a dollar, you press the palm on it a minute or so till it is as soft as the rest of your cheek, and that is all there is to it till half an hour later you repeat the process for the same spot or perhaps another spot on the face. Then, a few days later, a bit of skin comes off exactly as it would have come off in the case of a sunburn. The greatest concession I have ever seen an Eskimo make to a frostbite is to walk backwards (if there is a head-wind) while he is thawing it out. That is the greatest concession necessary. A man who keeps the road through the dark days and the first month after the sun's return is likely to count his frostbites by the hundred and to come to take the peeling off of skin from his face as naturally as he does the growth of his finger nails.

NOTES ON THE HISTORY OF GOTHA CARTOGRAPHY*

By MARTHA KRUG GENTHE, PH.D.

Whenever we speak of a specific style in cartography it must be borne in mind that no uniform style can be imagined for all kinds of maps. Roughly speaking, three classes at least of cartographic productions must be distinguished: (1) topographical sheets, (2) the so-called "geographical" maps of whole countries and continents in atlas size, and (3) school maps. Each of these classes needs its individual style because, in spite of their common purpose to depict a part of the earth's surface, their special purposes require special means of expression. A fourth category, which holds a place by itself, is what we call "applied cartography" because it uses the former three as bases for the demonstration, by means of special symbols, of natural and human conditions. Maps may thus become adjuncts of almost any science for which the geographical distribution of its phenomena is of any importance. In applied as well as "pure" cartography quite a variety of styles may develop.

No single cartographer can therefore produce equally good work in every field of cartography, and in spite of occasional utterances to the contrary, a certain diversity of styles is always found even within one and the same country or one and the same institution. The nearest approach to uniformity may be said to be found in the productions of government surveys, because the topographical sheets are all original maps with one and the same purpose and the problem of cartographical expression is practically limited to the finding of the best methods of reproduction, for which means are, as a rule, liberally provided.

Very different is the task of the cartographer who works for a private publishing firm. Only in very rare cases is he charged with the execution of an original map—to accompany, for instance, the account of a voyage of discovery. His regular work is rather to construct so-called "general" maps, on intermediate scales, by compilation from large-scale maps: this is the kind of maps used in atlases and as wall maps. We should be very much mistaken, however, if we thought the word "compilation" sufficient to characterize the

*Adapted from the German of Prof. Hermann Wagner, *Petermanns Mitteilungen*, Jan. and Feb., 1912.

method and value of such a map. While it is true that there are maps—too many of them—which are indeed nothing but a second-hand collection of all sorts of geographical data, the truly geographical map is very different, and it is indeed a genuine scientific production in spite of the quasi second-hand character of its contents. In order to draw such a map, the cartographer must be himself intimately acquainted with the authentic material on which it is based; he must use the most careful discrimination in selecting and arranging this material for the purpose of his map; he must insert every single feature, contours, names, figures, with the thought in his mind of their probable effect on the finished map; he must, in the actual process of drawing, give account to himself whether, and why, he ought to make a certain line lighter or heavier, a certain slope more or less steep, etc. He must, in one word, carry in his mind a perfect picture of that which he is to represent cartographically. Such a map can justly be awarded the name "original."

But this is not all. There will always be cases when the existing original material does not suffice to give such an all-round and well-balanced picture of the country in question, cases when the cartographer may have nothing to draw upon but written information, and sometimes not even this. Then if he is able, by virtue not only of his cartographical skill but even more of his geographical instinct and judgment, to supplement that which is lacking by means of personal intuition, to divine the traits of the picture which he cannot draw from the original, he ceases to be a mere cartographer and becomes a cartographical scientist. This is the species of cartographer for which Gotha became the training school during the second half of the nineteenth century.

The beginnings of this classical era of Gotha cartography are characterized by the names of Adolf Stieler, C. G. Reichardt, and F. von Stülpnagel. It would be very unjust to think less of these men because the imperfect technique of reproduction of their time places them at a disadvantage in comparison with those who came after them. It is their indisputable merit to have prepared the way for the great development of the later period and to have first gained for the institution which they served a reputation of thoroughness all over Germany.

Heinrich Berghaus and Emil von Sydow, who followed after them, first acquired something like universal fame. But it was not until Bernhard Perthes (who died in 1857) transformed the simple publishing firm into an organized workshop of geography and cartog-

raphy, with a whole staff of cartographers, scientific assistants, engravers, and the complete outfit for cartographic production, that Gotha became what has not inadequately been called the geographical clearing house of Europe during the latter half of the nineteenth century. It was Bernhard Perthes, too, who called August Petermann from London to become, not the director of the new institution, but its most prominent member.

Petermann had already shown himself a competent cartographer in England. Many were his publications during that period of his life. They were mostly contributions to applied cartography, as it had been the co-operation in the English edition of Berghaus's Physicial Atlas that brought him to Edinburgh, in 1845. Yet his work at that time was by no means epoch-making. The only indication of the Petermann of later years are a few constructions of itineraries of travelers and corresponding work on their diaries. This was the kind of work which was to make him famous at Gotha.

In Barth's large report on his travels almost all the maps were not only designed but also constructed and drawn by Petermann personally. The same is true of almost every map in the first volumes of the *Mitteilungen* which bear his name before he had trained some of his disciples to be his assistants. The topographical work is not the most conspicuous feature of these maps, nor can they yet be said to mark a decided advance technically. In order to appreciate their actual value we must examine their contents and study his method of working up the new material brought in by the travelers in harmony with what had been known about the respective countries before. In this way he originated at Gotha a style entirely his own and one which was exceedingly timely for the new age of discovery just beginning. It was this circumstance which induced explorers from all countries to send their reports to Gotha for first publication.

In spite of his immense working power he soon found himself unable to work up personally all the material thus constantly pouring in upon him. His talent, however, for training young men for independent work along his line came to the rescue. Soon his first disciple, Bruno Hassenstein, enabled him to limit his personal activities to the acquisition and sifting of the material and the general supervision of the execution of the maps. Petermann probably never drew a map himself after 1862.

In addition to Hassenstein must be mentioned Habenicht, Hanemann, Domann, and others who thus supplemented and, after his death, continued Petermann's work from the era of Barth down to

that of Sven Hedin. In order fully to realize the value of such a distinctive "style" in cartography one needs only to compare these maps with the maps illustrating other geographical publications, which do not dispose of such a staff of trained cartographers as *Petermanns Mitteilungen* do and which reproduce even to-day the rough sketches of explorers without submitting their contents to the hands of a cartographical expert. There is no doubt that the cartographical treatment of modern exploration as introduced by Petermann and continued by his disciples is not the least among the scientific merits of the Gotha institution.

Of great importance for the subsequent development of Gotha cartography was the connection of Petermann with the re-publication of Stieler's Hand-Atlas in 1861. At that time the atlas consisted of 83 sheets, and it was under the disadvantage common to all large atlases in that, when they become of a certain age, the necessary revisions can be put into effect only at great cost and very gradually. When Petermann entered upon this work a number of the older sheets had already been replaced by the work of two other leading cartographers of Gotha: Hermann Berghaus and Carl Vogel. These maps, although marking a decided step forward, cannot yet be called satisfactory, however. Neither of these two men had reached his full mastership at that time. It was the maps which Petermann had drawn by his disciples which first showed a distinctly new style. In spite of obvious differences in the special gifts and talents of his assistants Petermann succeeded in making them cooperate under the inspiration of his personality. The whole design, the contour, relief, especially the use and arrangement of lettering, show a character of their own, a broadness and uniformity of conception not found in maps of this kind before. From that time on Petermann worked untiringly, with word and pen, for the general recognition of his views on the needs of modern cartography. He advocated better training for engravers and urged the use of better color schemes and of figures to indicate heights—a feature which had been unknown before him. His merits in this respect can hardly be overestimated.

It was one of the fortunate incidents in the history of science that a man like Petermann should have been discovered, at the right moment, by an institution like that of Gotha, where every means for testing and carrying out his ideas was cheerfully provided, regardless even of financial returns. If he was not made the official head of the institution it was because, at the time when it might have

been done, Berghaus and Vogel had long become his equals and could never have been put under him.

Of the two, Carl Vogel was the great master of relief. After the publication of his maps of Switzerland and the Thuringian Forest he stood unequaled among his colleagues in that line. Later he designed the fine map of Spain for Stieler's Hand-Atlas which opened the series of maps of European countries for which that atlas is justly famous and which won for Germany the first place in map drawing at the time. The "Map of the German Empire" in 27 sheets which he published later is another masterpiece of lasting value.

Hermann Berghaus, the nephew of Heinrich Berghaus, on the other hand, was the scholar *par excellence* among the cartographers of Gotha. Not satisfied with working up all the cartographic material at hand for a given map, he also studied the whole geography of the respective country, entering upon every detail of scientific discussion. This was partly a disadvantage, because it prevented him from clearly seeing the needs of the purely geographical map, so that the sheets designed by him were eliminated from Stieler's Hand-Atlas in later editions. But on the other hand it was this trait which made him the master, not to say creator, of the special field known as applied cartography. The new edition of the great Physical Atlas furnished the first opportunity for the development of his special talent. The Hydrographical Atlas, which forms the second part of the Physical Atlas, is almost entirely his own work. His enormous knowledge of physical geography appears in the splendid selection of morphological, hydrographical, and similar types illustrated on the inset maps of the atlas. Likewise he was almost the only one among the older cartographers who took a deeper interest in mathematical cartography, especially the application of the various projections to geographical maps.

His "Chart of the World" is the greatest document of his skill and learning. The wealth of its contents, the perfect arrangement of the same, the choice of symbols, lines and colors (most of which he used for the first time on this map) bespeak the wealth of ideas which he deposited in it. He did but little literary work because he addressed himself less to the general public (as Petermann did to a great extent) than to the scientific geographer, and to him he spoke almost exclusively by his maps. Anyone who studies them cannot but be overwhelmed by the amount of learning which they contain.

Viewed in this light Berghaus is perhaps the most modern of the

three great men of the classical period of the Gotha institution. For the needs of modern geography require more and more a continuous co-operation of geographer and cartographer in the production of maps. The time is gone when scientific geographers were strangers to the cartographical arts and accepted their products with gratitude and without criticism. Geographers of the present want to advise and co-operate in the making of maps, and they attribute to the scientific foundations of the map the same value as to its cartographical perfection. In this respect the Gotha of to-day is holding its own among its contemporaries in no less a degree than did the Gotha of old at the time of Petermann, Vogel, and Berghaus.

HARSHBERGER'S "PHYTOGEOGRAPHIC SURVEY OF NORTH AMERICA"*

A REVIEW

By ROLAND M. HARPER

In 1896 Prof. Adolf Engler of Berlin, who is perhaps the greatest all-round botanist in Europe to-day, and Prof. Oscar Drude of Dresden, a phytogeographer of world-wide reputation, with the intelligent co-operation of a publishing house which has had long experience with scientific books, and with characteristic German thoroughness, began the publication of a series of large octavo monographs under the general title of "Die Vegetation der Erde," apparently designed ultimately to describe the vegetation of the whole world. These monographs have been appearing ever since at the rate of nearly one a year, averaging about 500 pages. It was the original intention to print them all in German, but an exception has been made in the case of the present one, and wisely so, for its English-speaking readers must form a large majority. Most of the monographs hitherto published in this series deal with small parts of Europe, but there is already one on Western Australia, one on Chile, and one on the Peruvian Andes. No. IX is devoted to Africa, but that is being published in parts, of which three, aggregating nearly 1500 pages, have been issued, and more are promised; while the whole of our most diversified continent, from the Arctic Circle to Panama, is treated in No. XIII, a volume of less than 900 pages.

The preparation of the monograph on North America was entrusted soon after the inception of the work to Dr. J. W. Harshberger of the University of Pennsylvania. After five years of work on the manuscript and nearly as much

* Phytogeographic Survey of North America. A consideration of the phytogeography of the North American continent, including Mexico, Central America and the West Indies, together with the evolution of North American plant distribution. (*Die Vegetation der Erde, XIII.*) By John W. Harshberger, A.B., B.S., Ph.D. Pp. lxiii+790. 18 plates and map. Leipzig, Wilhelm Engelmann (also New York, G. E. Stechert & Co.), 1911. Price 52 marks, unbound (53.50 marks bound).

time spent in seeing it through the press, the book was issued early in the summer of 1911. It is the largest volume in the series, if the parts of Prof. Engler's own monograph on Africa are counted as separate volumes. Although at least six botanical reviews of it have already been published in this country,* it deserves to be discussed also from a geographical point of view, as there is much in it to interest geographers. Two of the reviews here cited are hostile criticisms, while the others are commendatory or nearly impartial; and it is interesting and somewhat significant from a geographical standpoint that the two reviewers who have found the most fault with the work have traveled much less than have those who have praised it.

For the stupendous task of sketching the vegetation of North America probably no better equipped person could have been selected than Dr. Harshberger. While other American phytogeographers have been studying herbarium specimens, gathering climatic data, or delving deeply into various special problems, he has spent many of his vacations in the last two decades in traveling over the country and taking notes, which he has shared generously with the readers of botanical periodicals. Before completing the manuscript of this book the author had visited nearly every state in the Union outside of the southeastern pine-barren region and the southwestern desert region, as well as Quebec, Ontario, Mexico, Jamaica, Haiti and Bermuda. Probably none of his reviewers has seen quite as much of North America as he has.

The contents of the volume may now be summarized. After the preface, table of contents, and a 51-page German synopsis by Prof. Drude, the work is divided into four parts, namely: (1) history of exploration, with bibliography (92 pp.); (2) geology, topography, climate, and a few floristic statistics (77 pp.); (3) geological history of the flora, geographical affinities, and summary of a few previous systems of regional classification for this continent (176 pp.); (4) vegetation regions of North America and their subdivisions, with descriptions of vegetation (359 pp.).

The bibliography in Part 1 covers 47 pages, with about 1,500 titles, covering a wide range of subjects, from bare lists of plants with no information about habitats, to papers that are primarily geological. It is divided into one general and eight special parts, the latter corresponding to rather arbitrary geographical divisions, following political boundaries for the most part, as so many of the individual papers do. Although the author disclaims any pretension of completeness for this bibliography, and one could easily point out errors, it is undoubtedly the most complete of its kind yet published, and it ought to fill a long-felt want. Owing to the length of time required for such a large book to go through the press, and the fact that the bibliography comes near the beginning, it is brought down only to 1908; but many papers published in 1909 are mentioned in footnotes farther on. One cannot help admiring the patience and impartiality with which the author sifted such a vast mass of literature, to extract from each paper the kind of information that was needed for his book.

The nature of Part 2 can be easily imagined from its title. Part 3 deals mainly with paleobotany and botanical history, a subject in which Prof. Engler is greatly interested (which accounts for its inclusion in nearly all the volumes

* Taylor, *Torreya*, Vol. 11, pp. 190–199, Sept. 1911 (replied to by Harshberger in the next number); Fernald, *Rhodora*, Vol. 13, pp. 213–224, Oct. 1911; Bessey, *Science* II, Vol. 34, pp. 810–812, Dec. 8, 1911; Shreve, *Plant World*, Vol. 14, pp. 277–280, Nov. 1911; Cowles, *Botanical Gazette*, Vol. 53, pp. 181–182, Feb. 1912; Campbell, *American Naturalist*, Vol. 46, pp. 166–184, March 1912.

of the series), and which was not entirely new to Dr. Harshberger. Nearly four pages are devoted to this part in Prof. Campbell's review, to which the reader is referred for further particulars. Chapters 3 and 4 of Part 3, which deal with the postglacial history and geographical affinities of the flora, contain many plant lists and other matter almost duplicated in Part 4. Part 3 closes with a 4-page review of the geographical classifications of Meyen (1836), Grisebach (1872), Engler (1879-1882), Drude (1890), Merriam (1894, 1898), Clements (1902), Engler (1902), and the author. One might suppose from reading his explanation here of how his map was constructed that it was based primarily upon Merriam's,* but an examination of the map itself gives a different impression, as will be pointed out farther on.

Part 4, constituting nearly half the book, is of course the most important, and the one which called out the author's best talents. In this the continent and outlying islands are divided into seven main divisions, as follows: (1) Arctic and subarctic; (2-4) temperate zone (Atlantic, interior and Pacific sections); (5) subtropical Mexico; (6) tropical Mexico and Central America; (7) West Indian region, including South Florida, the Bahamas and Bermuda at its northern limits, but apparently not the Lesser Antilles (which were not visited by the author). Each of these major divisions is subdivided many times, the final unit being the plant association, covering sometimes only a few acres. Some of the lesser divisions, such as the "New Brunswick area," "interlacustrine area," and "Arkansas-Louisiana district," seem rather arbitrary, but they are no more so than would be divisions based on altitude or isothermal lines, for instance, and in the present state of phytogeographical knowledge it would not be very easy to suggest a better system.

In this part the author has attempted to combine into a harmonious whole his own observations and those of several hundred other explorers, made at different times, from many different points of view, and with various degrees of accuracy and thoroughness, often with no visible marks to distinguish the reliable from the unreliable ones. Under the circumstances it was inevitable that the treatment of different regions should be somewhat uneven, and that some errors should creep in; but until some one has covered the whole ground in a more thorough manner (which is not likely to happen very soon), this part should not be criticized severely. A minor defect apparent here is that original and second-hand observations are not always sharply distinguished; but the footnote references to the writings of other botanists are so numerous that one can hardly blame the author for omitting, or the printers for overlooking, one of them occasionally.

The difficulty of describing the vegetation of parts of North America that one has not personally explored can be fully appreciated only by those who realize that the great majority of our "local floras," at least with the exception of the more recent ones, are mere lists of plants, arranged taxonomically or alphabetically, or sometimes in no logical order, without reference to the manner of their occurrence in nature. Some indeed mention the habitat of each species in a more or less desultory way, but few (almost none up to the time when this series of monographs was inaugurated) give any idea of the way in which the

* See *Bull. 10*, Biological Survey, 1898; also frontispieces to "Check List of North American Birds" 3rd edition, Amer. Ornithologists' Union, New York, 1910, and "Forest Physiography" by I. Bowman, 1911.

plants are associated to make up the vegetation, and still fewer indicate the relative abundance of the species in their associations. The dearth of descriptions of vegetation is especially noticeable in New England, where there are, and always have been, more botanists than in any equal area in the Western Hemisphere. It would probably be difficult to find in botanical literature definite statements about the habitats of more than half the species of flowering plants in the United States. Even in the latest descriptive flora of the northeastern states ("Gray's Manual," 7th edition, 1908), a great many species are left without the slightest indication of habitat, and the thirty-volume "North American Flora," now in course of publication by the New York Botanical Garden, ignores habitats almost completely.

A fruitful source of error in such compilations as Dr. Harshberger's is the fact that in different botanical papers the same name is often applied to perceptibly different plants in different regions by persons who have had no opportunity to make the necessary comparisons, or (which is perfectly natural and excusable) have not been aware of differences that were not known at all at the time; and different names are often given to the same plant at different times, owing to changes in classification and nomenclature which are going on more or less continually. Only a person who is constantly employed in taxonomic work (and the proportion of botanists thus employed seems to be steadily decreasing) can reasonably be expected to keep up with such changes. (That the author has not been oblivious of such difficulties is shown by the second footnote on page 547, where a confusion in names between two western hemlocks is pointed out.) His own identifications of plants in the field are sometimes erroneous, but such mistakes would be made by any one who travels too rapidly to make specimens of every doubtful plant for subsequent study and comparison. Those who are most careful in these matters simply cannot cover as much ground in a season or in a lifetime as those who are content with more superficial observations. From the phytogeographer's point of view it is not absolutely essential that every plant should be correctly identified, anyway, for it would be quite possible to prepare a fairly satisfactory description of the vegetation of a given region without naming a single species.

A colored map of North America on the scale of 1:40,000,000, lithographed by Brockhaus of Leipzig, is inserted at the end of the volume. This map, which has been given very little notice by previous reviewers, particularly the untraveled ones, is undoubtedly the best vegetation map of the continent yet published; in fact there is hardly anything else that approaches it. The author has here tried to represent the vegetation provinces (which would also serve very well for other geographical purposes) just as they are, regardless of any unproved hypotheses of temperature control, effects of evaporation, etc., and he has succeeded pretty well, considering the small scale. Over thirty divisions (which do not correspond exactly with those in the text, but seem more natural) are distinguished by different colors and patterns, and the limits of the ranges of about twenty species of trees are indicated by lines of various kinds; the whole making almost too much detail for a map of that size.

The work is further embellished by four outline paleogeographical maps, 12 line-cuts of rare or interesting plants (all of these last taken from Engler & Prantl's Natürliche Pflanzenfamilien, like many of the illustrations in previous volumes of the same series, and included in Chapter 4 of Part 3, which relates

to the geographical affinities of the flora), and 37 half-tones, from various sources. Twenty-one of the half-tones are beautifully executed on inserted plates, and seem to be from exceptionally good photographs, some of which are here published for the first time.* With such a limited number of illustrations some very interesting and fairly well-known regions, such as New England, Georgia, Alabama, Louisiana, Cuba, Bermuda, and the whole territory between the Appalachian Mountains and the Mississippi River, are not represented at all; but of course it would have been impossible to illustrate such a comprehensive work adequately without greatly increasing its bulk and cost.

The index, covering 86 pages, is said to contain 7,400 plant names, including many synonyms. (It should be noted here that this volume deals not only with flowering plants and ferns, but also with the less conspicuous lower cryptogams, though to a much lesser degree, for the latter are much less frequently mentioned in phytogeographical works, and accurate information about their distribution is scarce.) Some of the species are mentioned over fifty times, and most of them more than once, so that there must be at least 15,000 page-references in the index. And this seems to have been compiled by the author himself, instead of being delegated to some uninterested person, as is too often the case with indexes.

Over 1,100 different authors, collectors, explorers, etc., are mentioned in the book, and an index to their names would have been a useful addition; for as it is, a reader desirous of knowing whether or not some particular paper was consulted by the author must look in one or more divisions of the main bibliography, and then if he does not find it there he cannot be sure that it is not mentioned in some of the very numerous footnotes, which, as before stated, contain many additional titles. The lack of an index to localities has been commented on by one critic, but that is not a serious matter in a work whose contents are arranged geographically for the most part, and, furthermore, it would be very hard to decide just how much to include in such an index.

On the whole, Harshberger's Phytogeographic Survey, instead of being an "unfortunate volume," as one reviewer has called it, is one of the most valuable contributions to North American geography ever published. It is essentially an encyclopedia of North American vegetation—the only one of its kind, too—and its shortcomings are mostly those common to all encyclopedias. The botanist who wishes to find out something about the vegetation of distant parts of the continent will find in it references to most of the available botanical literature for each region, and copious extracts from some of the more important papers; and it ought to stimulate those who find their own neighborhoods inadequately described into supplying the missing data to the botanical public, especially in those thickly settled and much-botanized regions where the possibility of discovering new species or even new stations for plants is almost exhausted, and where there are many once enthusiastic botanists whose scientific activities have almost ceased, apparently for lack of a good example to turn them from the old-fashioned botany of the herbarium and laboratory to the comparatively untrodden field of phytogeography.

* Plate 10 is evidently from the same photograph as Plate 29 in the Twelfth Annual Report of the U. S. Geological Survey, Part I, 1892.

BARTHOLOMEW'S ATLAS OF ZOOGEOGRAPHY: A REVIEW*

By CHARLES C. ADAMS

Department of Zoology, University of Illinois

The authors of this atlas state in the preface that it is not a revision of any older work but is the result of independent investigation of original sources. This statement is certainly true. It is the most elaborate treatise of the kind which has ever been published, and so is vastly superior to all of its predecessors. Such an extensive undertaking can no longer be the work of one man, and the present co-operative plan is evidence of the advantage of this method.

Geography, to the authors, is clearly the science of distribution, and the description and mapping of the ranges of the different families, genera, etc., is their idea of zoogeography. The general position of this work might be described as a revised atlas to accompany Wallace's "Geographical Distribution of Animals," 1876. But the geographic standards and ideas, in some parts of the world at least, have changed considerably since that date, and the *explanatory* aspect has been coming more and more into the foreground. This atlas unfortunately shows but little trace of this influence, although the general processes of dispersal are discussed in the text. There are maps showing ocean currents and the distribution of various types of vegetation, and diagrams are given of the influence of the land relief and depth of the sea upon the distribution of animals, as well as two maps to show the routes of migrating birds, yet the influence of the salinity, density, and temperature of the sea water and the climate of the lands are neglected or ignored, and a series of paleogeographic maps is lacking. That paleogeographic maps should be omitted at this date when they throw so much light upon zoogeographic relations and when we have such valuable ones is a very serious fault. The vegetational map is a valuable feature in such a volume. We, therefore, miss in this atlas the adequate recognition of the influence of certain factors which control in part the present fauna, as well as the recognition, in the form of maps, of the former conditions whose influence has persisted until now. It is thus the ecological aspect, the response of the animal to the conditions of its existence, which is not adequately developed in this atlas. To this degree it is not representative of the status of the science to-day, for it covers only a part of the field—the distributional aspect.

If we consider now the atlas as a study in descriptive distribution its strong features are evident. The volume consists of two sections, text and maps. The text is divided into four parts. The first is a very concise outline of the salient principles of distribution. The second is a general his-

* Atlas of Zoogeography (Bartholomew's Physical Atlas: Vol. V). Prepared by J. G. Bartholomew, W. Eagle Clarke and Percy H. Grimshaw. 67 pp. text, 36 plates, index. John Bartholomew & Co., Edinburgh, 1911. £2, 12s, 6d. 18 x 12.

torical account of the various efforts that have been made to divide the world into zoogeographic regions: with slight revision Wallace's is considered the most natural and is made the basis of this work. These regions, the Palearctic, the Ethiopian, the Oriental, the Australian, the Neotropical, and the Nearctic, are taken up *seriatim*, and each is discussed with regard to its extent, subdivisions, physical features, zoological characteristics and affinities, each account concluding with a statistical summary or census of the number of terrestrial families of vertebrates found in the region under consideration, and an indication of the families which are restricted or peculiar to it. As an appendix to this there are short chapters on insular and marine faunas. The total number of families of terrestrial vertebrates recognized is: mammals, 82; birds, 148; reptiles, 52; amphibians, 24; in all, 306.

The third part consists of the descriptive text which accompanies the plates. Both text and plates are devoted to the different families, genera, etc., beginning with the higher apes and descending the zoological scale. This includes all the families of mammals, birds, reptiles, amphibians, most of the families of fishes, and a selection of families and genera among molluscs and insects. A large number of valuable and interesting facts are thus assembled, representing a vast amount of work on the part of the authors. On account of the fact that the boundaries of certain families and genera coincide with similar ecological differences it is possible to gain from the maps many valuable ecological relations. The authors have shown good judgment in not attempting to put too much on a single map and have maintained simplicity by multiplying the number. A single plate may have from six to ten maps.

The fourth part is a classified bibliography of about 1,000 titles. In addition to general works each region is furnished with lists of references on vertebrates and a selected list on the molluscs and insects which are mapped. There is a special list given on the Antarctic and sub-Antarctic.

The plates of maps are thirty-six in number, measuring 15 x 19 inches. They are beautifully colored and of the same superior quality as in the "Meteorological Atlas" of the same series. The maps number over 200. The first plate contains a map of the zoogeographic regions after Wallace, and two smaller maps, one showing the prevailing vegetation and ocean currents, the other the bathy-orographical configuration of the world. The second plate is devoted to the boundaries of the zoogeographic regions proposed by the Sclaters, Heilprin, and Lydekker, and to the marine areas of Ortmann and Sclater. The next series of twenty-four plates is devoted to the vertebrates, including all of the families of mammals, birds, reptiles, and most of the fishes. Two plates are devoted to molluscs and seven to insects. The last plate consists of a diagram to show vertical and latitudinal distribution upon land and in the sea.

The volume is concluded with a good index to the common and scientific names and thus permits ready access to the maps.

When we consider the volume as a whole, and from the standpoint from which it was prepared, nothing but praise can be given. In its particular field it is the most important work of the kind ever published, and is essential to both the geographer and the zoologist.

From the vantage ground acquired by these authors during the preparation of this atlas they call attention to Siberia, which is much in need of thorough zoogeographic exploration. This is a fact which deserves emphasis. A few

years ago Stejneger and Miller called the attention of the Carnegie Institution to the desirability of the exploration of Eastern Asia and showed that it was zoogeographically the most important large area awaiting thorough exploration. Thus the authors have not only shown us what has been done, but also what remains to be done.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

THE DECEMBER MEETING OF THE SOCIETY. A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 West 39th Street, on Tuesday, December 17, 1912, at 8:30 P. M. The Chair was occupied by Vice-President Greenough.

The following persons, recommended by the Council, were elected to fellowship:

Norman L. de Courcey-Burnett,	Geo. B. Herzig,
Max Ferrand,	Jas. S. Higbie,
Edward E. Free,	Wm. S. Long,
Robert A. Gardiner,	William du Pont,
Sidney Harris,	John H. Williams.

The Chairman then introduced Miss Marion Cock, who addressed the Society on "Greece." The lecture was illustrated by numerous lantern slides. On adjournment, the audience had an opportunity to meet Miss Cock in the lower hall.

NORTH AMERICA

PHYTOGEOGRAPHICAL EXCURSION IN THE UNITED STATES. A preliminary announcement has been issued by Prof. Henry C. Cowles of the University of Chicago and Prof. Frederic E. Clements of the University of Minnesota with regard to an international phytogeographical excursion to be held in the United States in August and September, 1913. The excursion is to begin at Chicago about August 1 and close at New York about October 5. Opportunity will be given to participate in local excursions about New York, Washington and Philadelphia. It is hoped that the entire necessary expense for transportation, lodging and subsistence from New York and back to New York will not exceed the sum of $400.

The following features of phytogeographical interest will be studied: near Chicago, examples of the deciduous forests of the eastern United States, the Lake Michigan sand dunes, tamarack (*Larix*) swamps, edaphic prairies and aquatic vegetation; in Nebraska, climatic prairies and salt basins near Lincoln and sand hills near Halsey; the vegetation of the foothills, mesas and mountain parks and of the sub-alpine and alpine region of the Rocky Mountains of Colorado as illustrated in Estes Park, at Colorado Springs and Minnehaha and on Pike's Peak; alkali vegetation, sagebrush (*Artemisia*) desert and irrigated lands near Salt Lake City; mesophytic conifer forests, bogs, salt marshes and marine algae near Seattle, Wash.; sub-alpine and alpine vegetation on Mt. Rainier; the groves of Big Trees (*Sequoia gigantea*), the forests of redwood (*Sequoia sempervirens*), the groves of Monterey cypress (*Cupressus macrocarpa*) and the chaparral of California; the invasion of new territory by desert vegetation near Mecca, Cal.; lowland and highland desert and mountains with transition from desert to conifer forests near Tuscon, Ariz. The itinerary includes the Great Salt Lake, the Yosemite National Park and the Salton Sea. Among institutions to be visited are the University of Chicago, the University of Nebraska, Leland Stanford University, the Carnegie Laboratory at Carmel, Cal., and the Carnegie Desert Laboratory near Tucson, Ariz.

MAP OF PETRIFIED FOREST. The region of the Arizona Petrified Forest was surveyed by the U. S. Geological Survey in 1910, and the resulting map has just been issued. Its title is the Petrified Forest quadrangle. It includes the principal portions of the Petrified Forest National Monument, a reservation created to protect these natural wonders against commercial vandalism, which was making serious inroads into the petrified specimens. The map shows the location and topography of six separate forests, including the famous Petrified Natural Bridge. The fossil trees of these forests had been submerged beneath a heavy covering of soil and then silicified and turned to stone. This stone is exceedingly hard. It is an agate, of many colors, and is susceptible of a very high polish. The Petrified Forest is just south of the line of the Santa Fé Railroad, in Navajo and Apache counties, Ariz., and is reached by wagon road from the town of Adamana.

CITY AND SUBURBAN TEMPERATURES AT NEW ORLEANS. Much interest has been taken in the United States within the past few months in the effect of large cities upon the temperatures observed at regular meteorological stations within their limits as compared with the temperatures recorded at more exposed places near by. The local forecaster of the Weather Bureau at New Orleans, Mr. E. D. Coberly, has compared the twenty-three years of records at the Weather Bureau station in that city with those kept at the Louisiana Sugar Experiment Station at Audubon Park, six miles west of the Weather Bureau office, and about 800 feet from the Mississippi River (*Mo. Weather Rev.*, Vol. 40, No. 4, 1912, pp. 573-574). The mean annual temperature is 0.6° higher in the city. The mean monthly temperatures are also higher in the city in every month except June and July, when the excess at the Park is 0.2° and 0.3° respectively. In October the monthly mean at the Weather Bureau station is 1.5° in excess. The mean maximum at the Park is higher every month in the year, the excess ranging from 0.2° in November to 2.1° in June (2.0° in July). The mean annual maximum is 1.3° higher at the Park.

In the case of the minimum temperatures, the reverse is true, those for the Park being lower, and the difference between the two stations is about twice as great as in the case of the maximum temperatures. The mean annual minimum at the Park is 2.6° lower than at the city station. The difference is greatest in October (4.2°) and November (3.6°). Obviously, the lower minima in the more exposed locality have an important relation to the occurrence of frost in the suburbs of large cities, when the minima in the latter do not fall to freezing. It may here be added that the mean monthly minimum temperatures recorded at the U. S. Weather Bureau office in St. Louis are from 1.5° to 9° higher than those recorded at the Forest Park Observatory, outside of the congested portion of the city.

To sum up in a general way, it appears that (1) the mean annual and mean monthly temperatures at the city station are slightly higher (1.5° at the maximum); (2) the mean maxima in the Park are higher, the greatest excess being about 2°; (3) the mean minima are lower at the Park, the greatest difference being a little over 4°. In other words, these differences are all slight, although perfectly recognizable; they all fall (in the cases here considered) under 4.2°. These results agree very well with the summary given by Hann in his *Handbuch der Klimatologie* (Vol. 1, English translation, pp. 29-30).

R. DEC. WARD.

ADVANCE IN PRICE OF TOPOGRAPHIC SHEETS. The Director of the U. S. Geological Survey recently announced an advance in the price of the topographic sheets issued by the Survey from five cents to ten cents apiece and from $3 a hundred to $3 for fifty copies. This advance took effect on Jan. 1, 1913. Although both the wholesale and retail rates have thus been doubled, the quantity which entitles to the wholesale rate, it will be seen, has been halved. This increase in the price of the topographic sheets, foreshadowed by the advance on July 1, 1905, from $2 to $3 a hundred, is due to a variety of causes. The Director says (*Press Bulletin No. 87, Dec., 1912*): "The constantly increasing refinement in the field work of the topographic surveys, the immense amount of detailed information which is put upon the maps, requiring the most expert and tedious drafting and copper-plate engraving, the

great care necessary in insuring the exact register for the three or four color lithographic printings, and the largely increased cost of labor and paper have made the increase in charge not only justifiable but necessary. As a matter of fact, ten or six cents for one of the standard 15-minute topographic sheets of the Geological Survey, which is in effect an almost exact reproduction of about 230 square miles of territory, is a merely nominal price. No comparable maps are issued by any private map-printing house, but if there were they would be sold at $1 to $3 apiece. The field surveying alone of some areas covered by a single map costs more than $5,000, and even $7,000 in very difficult country, while there are few maps which represent an expenditure for field work of less than $3,000."

The U. S. Geological Survey topographic sheets have long been known for their extremely low price, the comparable European maps, in spite of the greater age of the surveying organizations publishing them and the lower cost of labor abroad, being sold at much higher prices. The prices per sheet of some standard European topographic maps are, for instance: one-inch-to the-mile map of the British Ordnance Survey, 25 cents; Karte des Deutschen Reiches, 1:100,000, 36 cents (lithographic transfer, 12 cents); Carte de France, 1:50,000, 32 cents, 1:80,000, 20 cents (zinc transfer, 6 cents); Carta topografica del Regno d'Italia, 1:100,000, 20 and 10 cents, respectively; Topographische Karte der Schweiz (Dufourkarte), 1:100,000, 40 and 20 cents, respectively, Topographischer Atlas der Schweiz (Siegfried-Atlas), 1:25,000 and 1:50,000, 20 cents.

LANDSLIDES IN CANADA. The Geological Survey of Canada is giving attention to the prevention of loss of life through landslides. A landslide at Frank, Alberta, on April 29, 1903, in the Front Range of the Rocky Mountains east of Crowsnest Pass, resulted in the death of seventy persons, in the destruction of some of the houses in Frank, and of one and one-third miles of railroad. Within two months the Canadian Geological Survey had completed a report on the land-slide* in which the causes were said to include the opening of large chambers in a coal mine at the base of Turtle Mountain, from which the slide came. It was recommended that the village of Frank be moved out of danger from future slides. Because the town has not been moved and coal mining has continued to increase the danger, and because large cracks on the mountain have gradually widened, Mr. Brock, Director of the Canadian Geological Survey, again called attention to the danger of the situation in 1909 and 1910. This resulted in the appointing in 1911 of the Commission whose report† is here reviewed.

The report contains an excellent map of the landslide and the area on Turtle Mt. where, it is feared, another avalanche may occur, a careful analysis of geographical and mining conditions in relation to landslides and renewed recommendation that the present town-site be abandoned.

The Commission says there is probability of another slide due to (*a*) special, local conditions favoring a landslide, including topographic, geological, and structural conditions, (*b*) general conditions, such as vibration due to earthquakes, local settling in the mines, or blasting, (*c*) the similarity of natural conditions in 1911 to those preceding the landslide of 1903, (*d*) the position of an adjacent peak left weakened by the 1903 avalanche, and (*e*) the formation of new cracks, showing incipient movement in the peak. They also believe that the influence of continued mining on the stability of Turtle Mountain requires the prohibition of mining in a specified area.

The map by W. H. Boyd, Chief Topographer of the Canadian Geological Survey, 800 feet to an inch, with 25-foot contours, shows the peculiar landslide topography, the extent of the avalanche scar, the topographic conditions on the

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*R. G. McConnell and R. W. Brock: Report on the Great Landslide at Frank, Alberta. Appendix to Part VIII, *Ann. Rept. Dept. Int. for 1902-1903*, Ottawa, 1904. 17 pp.

†R. A. Daly, W. G. Miller and G. S. Rice: Rept. of the Commission appointed to investigate Turtle Mountain, Frank, Alberta, *Mem. 27*, Dept. of Mines, Geol. Surv. Branch, Ottawa, 1912. 34 pp.

threatening adjacent mountain wall, and the present extent of fissures. An accompanying map outlines the rock mass now in danger of sliding and gives the approximate area over which such a landslide would extend. This latter includes practically the whole of Frank. LAWRENCE MARTIN.

ADDENDA TO CANADIAN TOPONOMY. At the suggestion of Mr. Rouillard, secretary of the *Société de Géographie de Quebec*, the minister of lands has given the names of Hanotaux, Lamy, Bazin and Bonin to the new districts formed in the Saint-Maurice region of Quebec province. (*La Géographie*, Vol. 24, No. 5, Nov. 15, 1912.)

HOMESTEADS IN BRITISH COLUMBIA. In a recent address before the British Columbia Conservative Association, held at Revelstoke, Sir Richard McBride, the Provincial Premier, made the announcement that the Government had surveyed 1,000,000 acres along the line of the Grand Trunk Pacific in British Columbia for the sole use of preëmptors, and that by the end of 1913 it would be prepared to offer 160 acres each to 30,000 *bona fide* settlers on preëmptions.

SOUTH AMERICA

SHIP CANAL AT BUENOS AIRES. In connection with the scheme for the enlargement of the port of Buenos Aires, the Senate has passed a bill granting a concession for the construction of the Mitre Canal. The concession, which is for seventy-five years, will have to be ratified by the Chamber of Deputies. The canal will start from the north channel of the port of Buenos Aires and will run along the river front to the mouth of the River Lujan; it will then follow the course of this river for about eleven miles from which point a cutting will have to be made across the islands in order to reach the River Paraná de las Palmas. The first section (to the mouth of the Lujan) will be between 262 and 492 feet wide at the bottom, and its depth will be 29½ feet below mean low river level. The second section will be 144 feet wide at the bottom, and its depth will be 26 feet below mean low river level. Should the canal be constructed much of the distance to the up-river ports will be saved, as well as the heavy pilotage dues now exacted, and these two factors should more than compensate for the payment of the canal dues which the concessionaire is authorized to collect. (Condensed from *Daily Cons. and Trade Repts.*, No. 301, Dec. 23, 1912.)

AFRICA

AFRICAN COTTON PRODUCTION. Egypt is still far ahead of the other African districts where cotton growing has been attempted. The area in Egypt devoted to cotton is over a fifth of the cultivated area, and the product constitutes four-fifths of the total value of exports.

Successful efforts to grow cotton have been made in various European colonies in Africa. In a communication to *La Géographie* (Vol. 24, No. 5. 1912, pp. 336-337), P. Clerget says that during 1908-09 the world production of cotton attained 22½ million bales, of which 21,400 bales were obtained from British African colonies, 4,166 from German African colonies and 740 from French African colonies. Uganda holds the first rank as a cotton producer among the British colonies. Its exports were 3,814 tons in the first three months of 1912, as against 2,945 tons during the corresponding period of 1911. Nigeria and Lagos follow next in order, and it is expected that the 1912 production will reach 12,000 bales. In Nyasaland the plantations are at an altitude between 1,080 and 3,600 feet. The yield from lands owned by the natives now amounts to about 700 tons. In Rhodesia about 5,000 acres have been planted with cotton. Experiments are also being conducted in the Gold Coast colony and in Sierra Leone. In the Anglo-Egyptian Sudan, the yields amount to between 8,000 and 12,000 bales, principally from the Tokar province and from the Suakin and Port Sudan hinterlands. The cotton acreage in this colony may still be easily doubled by irrigation and the valley of the Atbara and the region between the White and Blue Niles may be utilized advan-

tageously. It is likely that the railroad between Khartum and Port Sudan will contribute enormously to the development of this industry.

In the German colonies, the 1911 crop was made up of 5,000 bales from German East Africa and 2,500 from Togoland, as against 2,492 and 1,856 respectively in 1910. It is expected that the 1912 output will exceed that of 1911 by two-thirds.

The French have resumed cotton growing in Algeria where about 451 tons were produced in 1864. The industry, however, was entirely abandoned between 1878 and 1893. Recent attempts appear favorable, both as regards quantity and quality of the product. Experiments are being carried on in Tunis, Senegal, and the inner Niger delta, as well as in the Baule district of the Ivory Coast. The best progress has been achieved in Dahomey where the production increased from a half ton in 1904 to 136 tons in 1909, while the production for all of French Western Africa increased from one ton in 1904 to 177 tons in 1909. Attempts to grow cotton in the island of Reunion are also being made as well as in the French Somaliland and Madagascar.

Cultivation of Sisal Hemp in German East Africa. The British Vice-Consul at Daressalam reports that the cultivation of sisal hemp in German East Africa yields a crop second only to rubber. The plant was introduced from Central America about fifteen years ago, and the exports of fiber have increased from 204 metric tons in 1901 to 7,228 metric tons, valued at about $752,800 in 1910. The plants attain full growth in about seven years, but the first leaves can be cut after three years' growth. In 1911 there were about 47,039 acres planted with sisal in German East Africa, of which about 18,900 acres were productive. The majority of the sisal plantations are in the northern districts of the Tanga hinterland where about 39,500 acres are planted. There are about 4,938 acres in the district of Lindi, to the south, and plantations have recently been opened near the railroad running from Daressalam to Tabora. (Condensed from *Board of Trade Journal,* Vol. 79, 1912, No. 836, p. 519.)

A New Franco-German Boundary in Africa. The work of delimiting the new boundary between French Equatorial Africa and the German colony of Kamerun began in December. It is expected that the delimitation of the new boundary will be completed by November, 1913.

ASIA

A Russian Expedition by the North-East Passage. A Russian expedition sailed from St. Petersburg in July, 1912, under the leadership of Lieutenant G. Brussilov for a scientific voyage around the Arctic coast of Asia. The vessel secured is Sir Allen Young's old ship, the *Pandora,* which has been renamed the *Saint Anna.* According to the *Geographical Journal* (Vol. 40, No. 6, Dec., 1912), it is proposed to winter at the mouth of a Siberian river, probably the Khatanga, and to complete the North-East Passage during 1913. This route has never yet been followed by a Russian.

Earthquakes in China. A list of all the earthquakes recorded in Chinese chronicles has been compiled by P. Hoang and published in *Variétés Sinologiques* (No. 28, Shanghai, 1909). Paul Lemoine writes in *La Géographie* (Vol. 26, No. 5, 1912, p. 336), that the list comprises 5,793 earthquakes between 1767 B. C. and 1895 A. D. The Chinese recorders appear to have made a distinction by means of marginal annotations, between "mountain subsidences" and "earthquakes."

New Position Determinations in Asia. *The Geographical Journal* (Vol. 40, Dec., 1912, pp. 624-628), has a table containing the latitudes, longitudes and altitudes of a number of the most important places explored by Mr. Cecil Clementi, assistant Colonial Secretary at Hongkong, on his journey from Kashgar to Hongkong in 1907-08. The length of the route between these two places is about 3,990 miles. Altogether 141 places were fixed in latitude, 139 in longitude, while the altitude of 185 places was determined. It is proposed that a

detailed description of this important journey shall be published later as a separate volume, out of the notes and maps sent by Mr. Clementi to the Royal Geographical Society. The list of place and height determinations is reproduced below, omitting remarks:

PLACE-NAMES.	LATITUDE NORTH.			LONGITUDE EAST.			HEIGHT ABOVE SEA-LEVEL IN FEET.
	°	′	″	°	′	″	
Kashgar	39	28	45.1	75	58	0.0	4213.0
Maral-bâshe	39	46	41.5	78	6	20.2	3886.7
Ikûl	40	55	2.8	79	43	3.5	3675.6
Aksu (Chinese city)	41	7	57.2	79	55	25.2	3894.1
Bâi	41	46	58.6	81	58	22.3	4177.8
Kwazil	41	49	14.9	82	39	5.5	4068.4
Kuchar (Mahd. city)	41	43	49.1	83	7	55.7	3611.6
Kôrlâ	41	44	20.8	86	10	10.4	3463.1
Karashar	42	3	35.1	86	35	40.6	3471.4
Tabalghi	42	15	13.9	86	51	18.9	3627.2
Turfan	42	56	1.1	89	6	3.0	97.2
Urumchi	43	48	3.2	87	46	15.7	2736.7
Ku-mu-ti	43	57	40.7	87	50	2.8	1910.2
Tz'ŭ-ni-Ch'üan	44	11	50.0	88	29	35.4	1632.8
Hami	42	48	34.9	93	18	16.2	2140.5
Huang-lung Kang	42	45	6.1	93	44	34.3	2106.9
K'u-shui Yi	42	2	49.8	94	26	25.4	3140.7
An-hsi Chou	40	32	25.7	95	47	20.6	3410.2
Su Chou	39	44	27.1	98	26	56.3	4604.7
Hei-ch'üan P'u	39	31	12.4	99	30	22.9	4097.4
Kan-chou Fu	38	55	41.4	100	21	29.6	4642.5
Tung-loa Fên Hsien	38	49	18.6	100	48	14.7	4726.5
Shui-ch'üan P'u	38	22	54.9	101	40	5.8	6915.8
Yung-ch'ang Hsien	38	15	19.6	101	56	2.3	6071.4
Ching-pien Yi	37	40	50.8	102	45	8.6	5577.3
Chên-ch'iang Yi	37	9	3.5	102	53	29.4	8583.8
K'u Shui	36	15	5.4	103	25	14.3	5193.9
Lan-chou Fu	36	3	11.4	103	46	7.1	4806.8
Li-chia P'u	35	28	19.0	104	45	0.1	6211.1
Kuoa-chia Chên	34	58	17.7	105	23	41.8	4195.9
Ch'in Chou	34	35	34.8	105	33	45.6	3707.8
Hui Hsien	33	45	29.9	105	53	42.1	3027.8
Loa-yang Hsien	33	19	52.7	106	3	31.0	1939.1
Chien Chou	32	0	53.7	105	43	55.2	1393.7
Hsiao-han Chên	31	3	2.0	104	28	4.3	1512.6
Hsin-tu Hsien	30	49	31.3	104	17	38.1	1692.6
Ch'êng-tu Fu	30	37	52.9	104	19	23.9	1734.7
Ch'ung-ch'ing Fu	29	32	8.0	106	32	45.0	750.0
Ch'i-chiang Hsien	29	1	54.0	106	40	7.3	994.6
Sung-K'an Ch'ang	..	..	...	...	..	...	1226.2
Hou-pa Ch'ang	27	30	14.0	107	1	28.6	2870.6
Hsi-fêng Ch'ang	..	..	...	...	..	...	3535.1
Ku-t'ung Kai	26	28	32.4	107	35	28.4	3678.6
Pa-chai T'ing	26	12	28.1	107	51	58.8	3456.6
Ssŭ-lung Kai	25	52	3.0	109	12	58.4	.....
Lung-shêng T'ing	25	48	1.6	109	30	48.5	723.7
Kuei lin Fu	25	18	0.0	110	10	7.0	506.3
Fêng ch'ung T'ang	24	15	57.2	110	35	30.1	167.9
Wu-chou Fu	23	27	21.5	111	16	6.0	20.0
Canton	23	6	9.0	113	16	2.0	± 0
Shek-lung	23	6	28.1	113	52	11.7	± 0
Kowlun	22	18	13.2	114	10	27.9	± 0

EUROPE

GENERALIZATION OF THE DECIMAL SYSTEM IN FRANCE. In a report addressed to the Minister of Commerce and Industry, the *Comité pour la Propagation des Méthodes Décimales* of Toulouse recommends the adoption of the decimal subdivision of the day as well as that of the circular quadrant. The report says that the growing use of time as a factor in modern activity appears to necessitate its subdivision in units that lend themselves to ready computation. Tests made on a decimal watch during 1910 and 1911 by the Club Nautique at Nice showed plainly how the use of this base would simplify time calculations. At present the use of decimal time is confined to astronomers who have deemed it expedient to follow the example set by Laplace.

"The adoption of the decimal base as a system of angular subdivision will tend to simplify in a large measure current geodetic, cartographic and nautical computations. In practice the system has the advantage of establishing a simple ratio between angular and linear measures, since, on the surface of the earth, the length of a centigrade-arc is equal to 1 kilometer. The value of this relation both for purposes of ready retention by the memory as well as in ordinary calculation needs no comment. Its superiority over the ratios resulting from the use of the nautical or standard mile is likewise obvious. Neither is it necessary to dwell on the convenience afforded by the use of the same unit of length at sea and on land." * LEON DOMINIAN.

AN INTERNATIONAL CONGRESS OF FORESTRY. An International Forestry Congress will be held in Paris, June 16-20, 1913, under the auspices of the Touring Club de France. The programme is divided into five sections, *viz.*:— (1) sylviculture; (2) forest economics and forest laws; (3) forest technology, including uses and preservation of wood, its by-products, etc.; (4) afforestation, its advantages, etc.; (5) the value of the forest in developing touring and esthetic education. (*Board of Trade Journal*, Vol. 79, No. 836, Dec. 5, 1912.)

OBITUARY

FRANÇOIS ALPHONSE FOREL. The death of Professor François Forel, on Aug. 7, 1912, has removed the founder of the modern science of limnology. Born at Morges on Lake Geneva, in 1841, the great sheet of water became the subject of enthusiastic researches to which he devoted most of his life. In the volumes of "Le Leman" he reared his own monument and his "Handbuch der Seenkunde" demonstrated his ability to generalize facts common to all lakes. His literary style was charming and clear. He followed with intense interest our growing knowledge of seiches which was so much extended by the studies of the late Professor Chrystal and other members of the Survey of the Scottish lochs. His excellent work in the study of Swiss glaciers, and in seismology, enhanced his reputation.

PAUL LE MARINEL. *Le Mouvement Géographique* (Vol. 29, No. 48, Dec. 1, 1912), reports the death on Nov. 29, 1912, of Commandant Paul Le Marinel at the age of 54. He was the first Belgian to penetrate the Katanga district. He was particularly familiar with the Congo, where he began his career as a topographer in 1885. He founded the Lusambo outpost on the Sankuru River in 1888. This locality subsequently became his headquarters for the exploratory work he undertook in the Bena-Kamba region along the Lomani River. In 1893 he was appointed State Inspector for the districts of Stanley-Pool, Kasai, Eastern Kwango and Lulaba. He resigned from the army and the service of the Congo Free State in 1906.

GENERAL

EXPERIMENTS ON THE PROPERTIES OF ICE. One of the last phases of scientific work of the late Professor R. S. Tarr was a laboratory investigation of the properties of ice, in an attempt to find out the nature of the movement of glaciers (R. S. Tarr and J. L. Rich, The Properties of Ice—Experimental Studies—*Zeitschrift für Gletscherkunde*, Band VI, Heft 4, April, 1912, pp.

* Rep. 8th Int. Geogr. Cong. 1904, pp. 571-573.

225-249). These studies were carried on during the winter of 1910-1911, and were continued by the senior author in field observations in the summer of 1911, and by laboratory studies in the winter of 1911-1912, which were terminated by his lamented death in March, 1912. It may be stated now, however, that this second winter of laboratory observations, which were most fruitful in connection with the nature of glacier movement, will be described later from the author's notes.

The experiments of the first winter are partly a repetition of earlier physical investigations and partly new lines of investigation. In connection with them, Tarr and Rich carried on optical studies of the ice used, devised new apparatus for their investigations, and even sent several thousand miles from Ithaca to the Selkirk Mountains in Canada for glacier ice with which to make studies.

Their examinations were along the lines of (a) regelation, (b) crushing tests, (c) welding tests, (d) experiments in deformation, and (e) high pressure experiments. The regelation tests confirmed well-known experiments, and showed that the ice cut through by a wire loses little or no strength thereby, and that the optical orientation along the path of the wire is undisturbed. The crushing tests, even at temperatures above freezing, brought out variations related to (1) the rate at which the load was applied, (2) the direction of the crystals, (3) yielding as a result of pressure melting during the application of the load, and (4) the flowage of the ice under the load. The welding tests brought out a doubt as to the probability of pressure melting. The experiments in deformation led the authors to advance four tentative propositions.

"1. The deformation is in the nature of plasticity; that is, a certain minimum stress is required for its initiation. Until this stress is reached there will be no permanent deformation. This plastic yield point lies near the breaking point of the ice.

"2. The ease with which deformation may be produced varies with the direction in the crystal.

"3. The optical properties of a crystal are affected by such deformation, the effect being dependent upon the direction in the crystal in which the deformation takes place.

"4. Granular ice, composed of interlocking crystals, is subject to deformation equally with a single ice crystal."

The high pressure experiments confirmed the knowledge (1) that ice readily flows under pressure, (2) that snow can be changed by pressure.

The outdoor, winter conducting of these experiments, the making from snow and from pond-ice, of ice that was optically indistinguishable from the glacier ice of the Illecillewaet Glacier, with its undulatory extinction, mark these experiments as of unusual interest, and the publication of the results of Professor Tarr's later, and unfortunately his last, experiments will be eagerly anticipated by students of glaciology. LAWRENCE MARTIN.

THE LIVINGSTONE CENTENARY, 1913. The Royal Geographical Society will hold a meeting in commemoration of the birth of David Livingstone on March 17, 1913, when Sir Harry Johnston will give an address, and an exhibition of relics associated with Livingstone's work will be arranged. It is hoped that Sir John Kirk, the only survivor of the expedition of 1858-64, will be present. The celebrations of a more general character throughout the country will include a national memorial service in St. Paul's Cathedral on March 19, the anniversary of the explorer's birth, and, in the evening of the same day, a national demonstration at Albert Hall. The speakers at this meeting will include Lord Balfour of Burleigh, Sir Harry Johnston, Dr. Wardlaw Thompson (senior Foreign Secretary of the London Missionary Society, under whose auspices Livingstone first went to South Africa), and Bishop Tucker of Uganda. Special celebrations will be held at Glasgow, both by the University, which claims the explorer as a former student and graduate; by the Elgin Place Congregational Church of which he was a member; and by the municipality. (*Geographical Journal*, Vol. 40, No. 6, Dec., 1912.)

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

Old Indian Trails. Incidents of Camp and Trail Life, Covering Two Years' Exploration through the Rocky Mountains of Canada. By Mary T. S. Schäffer. xiv and 364 pp. Map, ills., index. G. P. Putnam's Sons, London, 1911. 8½ x 5½.

Mrs. Schäffer's book is related to Dr. Coleman's* by more than the chance meeting of their parties on Wilcox Pass in 1907, since much of her journeying covers valleys and passes previously traversed by him. The atmosphere differs, the masculine viewpoint contrasting with the feminine, the geological training with the botanical, the solution of certain problems (Brown, Hooker, Robson) with mere delight in beautiful scenery and the camp-fire as an end in itself. Varying therefrom in details and judgments, the two books combine to give a very complete description of the region they jointly cover. The reader of one should read the other. Outside the field of Dr. Coleman's travels, Mrs. Schäffer and her friend, Miss Adams, were the first women to follow Collie and Baker's trail (1897) from Howse Pass to Field and the route up the West Branch of the North Fork of the Saskatchewan (more poetically named Naashan River by the author) to the Alexandra Peaks and Columbia Snowfields (Thompson, 1900). C. S. THOMPSON.

Identification of the Economic Woods of the United States. Including a Discussion of the Structural and Physical Properties of Wood. By Samuel J. Record. vii and 117 pp. Ills., index. John Wiley & Sons, New York, 1912. $1.25. 9 x 6.

It is supposed that, owing to the decrease in the supply of standard kinds of timber woods, the practice of false substitution of woods on the market has become common. Since the variety of woods is large and their resemblance very close, it is stated that identification by mere appearance is unsafe; that a "knowledge of the fundamental differences in their structure" is essential.

The book is designed primarily as a manual for students of forestry, to be used in the laboratory rather than in the field. Part I is given to a rather close analytical study of economic woods and Part II contains a key to the identification of these woods. A bibliography, five plates showing sections of wood and one map of the United States, showing the natural forest regions, complete the book. EUGENE VAN CLEEF.

The Story of Old Fort Dearborn. By J. Seymour Currey. 172 pp. Ills. A. C. McClurg & Co., Chicago, 1912. $1. 8 x 5½.

Another bit of literature contributed to a field already flooded with similar books containing matter that adds little new information. It is practically a chronological account of the events leading up to the building of Fort Dearborn at the mouth of the Chicago River, and the subsequent massacre of its inhabitants. There is not much interpretative discussion or suggestion. The literary style is not pleasing, the reader being relieved somewhat by the introduction of quotations that stand out in contrast with the text as a whole.

* Reviewed in Vol. 44, 1912, p. 919.

The English could be much improved. A few maps drawn from description and sketches showing the area in relief are interesting.

EUGENE VAN CLEEF.

The Texas-California Arc of Primary Triangulation. By William Bowie. 141 pp. Ills. *Special Publication No. 11*, Coast and Geodetic Survey, 1912.

This report contains the results of the arc of primary triangulation which extends from central Texas westward to southern California, connects the triangulation of the 98th meridian and that of the Pacific arc, joins the United States and Mexican boundary surveys at a number of points, and throughout its length furnishes bases from which lower grades of triangulation may be extended for the control of boundary, topographic and other surveys. In the report are given the latitude and longitude of the stations, with azimuths of the lines between them.

The scheme of triangulation is more than 1,200 miles in length, and the geographic positions were determined for about 300 stations and objects. This triangulation was completed by one observing party in three seasons, totaling less than seventeen months, which is remarkably rapid for this class of work. Many of the stations were on mountain peaks, some of which were over 10,000 feet in elevation. The maximum length of line observed over was 121 miles, while the average length of lines of the main scheme of triangulation to the westward of El Paso, Texas, was over sixty miles. The angles were measured with a theodolite with a graduated circle twelve inches in diameter, and the observations were made during the day on heliotropes, and at night on signal lamps similar to automobile headlights. The lights from the heliotropes and lamps were clearly visible through the telescope of the theodolite, even over the longest lines. This was due to the very clear condition of the atmosphere. At the eastern end of the arc the theodolite was mounted on towers erected over the station. The report contains illustrations of the instruments used and of the towers. There are a number of illustrations which show the scheme of the triangulation. This arc of primary triangulation is of great geodetic and geographic value. Further facts about this triangulation were printed in the *Bulletin*, Vol. 43, 1911, pp. 447-448.

W. BOWIE.

The Wilderness of the North Pacific Coast Islands. A Hunter's Experience While Searching for Wapiti, Bears, and Caribou on the Larger Coast Islands of British Columbia and Alaska. By Charles Sheldon. xvi and 246 pp. Maps, ills., index. Charles Scribner's Sons, New York, 1912. $2. 8½ x 5½.

The author is a well equipped, keen observer, judging from the convincing and minute details of his descriptions. Although the book is in the form of a diary, it does not possess the monotony so often characteristic of such writing The fascination of the wilderness of the larger coast islands of British Columbia and Alaska is described quite realistically through an account of a hunt for wapiti, bear and caribou. (The wapiti is commonly known as the American deer.) The islands, under consideration are Vancouver, Montagne, Queen Charlotte and Admiralty, excursions having been made to these islands in the years 1904, 1905, 1906, and 1909, respectively.

Of special note is the author's observation of the tendency of the bear to run away from the hunter when disturbed, rather than to charge him, contrary to the stories of most hunters. His evidence is confirmatory.

At the close of the discussion of each trip the region traversed is redescribed in a brief summary that causes the reader to desire to follow in his footsteps.

Five maps accompany the text; a number of interesting photographs and a few fine drawings from descriptions are distributed throughout the book. An appendix consisting of a description of "A New Bear from Montagne Island, Alaska," and "The Queen Charlotte Islands Caribou," by C. Hart Merriam, notes on some habits of the Montagne Island Bear and an index, complete this pleasing descriptive geographic story.

EUGENE VAN CLEEF.

Southern Vancouver Island. By Charles H. Clapp. xiii and 208 pp. Map, ills., index. *Mem. No. 13, Geol. Surv. Branch, Dept. of Mines, Canada.* Ottawa, 1912.

This report deals principally with the general geology of the district, but begins with a description of the topography, and closes with fifty pages on economic geology. The description of the topography is especially good because it is based on modern explanatory rather than on old-fashioned empirical methods, and leaves the reader with a fairly clear mental picture of the essential elements of the landscape. One learns that southern Vancouver Island is a mountainous district of folded and faulted belts of resistant volcanics and non-resistant sediments trending northwest-southeast, which was reduced to a peneplain surmounted by considerable areas of monadnocks, then uplifted, maturely dissected, and later submaturely to maturely glaciated. In the central and southern parts of the region remnants of the peneplain surface determine an upland plain which is still an important element in the topography; but farther north and northwest the high monadnock areas give a more rugged scenery; while in the extreme southeast the peneplain surface was entirely destroyed by the removal of crystalline rocks which were evidently non-resistant.

Glacial overdeepening of the broad subsequent valleys and narrower transverse valleys was sufficiently extensive to form fairly good troughs which contain lakes, and to develop some fjords along the coast; but hanging valleys are said not to be prominent, and the irregularity of the shoreline is mainly attributed to coastal subsidence. A slight recent elevation is shown by a narrow coastal plain along the southwest coast, now extensively retrograded under wave attack.

A sketch map of physiographic provinces would have made clearer certain parts of the text. Photographic illustrations are sufficiently numerous and good. D. W. Johnson.

SOUTH AMERICA

Brazil in 1911. By J. C. Oakenfull. 3d Annual Edition. Feb., 1912. xii and 395 pp. Map, appendix and index.

A careful summary of a large variety of information about Brazil. The larger topics are Geography, pp. 1-9; Climate and Diseases, 10-20; Anthropology and Ethnography, 21-31; History, Population, Government, Finance and Transportation, 39-146; Natural History, 147-190; Agriculture, 191-216; Tropical Fruits, 217-237; The Pastoral Industry, 238-248; Geology and Mineralogy, 249-302; Thermal Springs and Tourist Resorts, 303-329; Literature, Art and Science, 330-336. The appendix is a gazetteer of the republic.

Chubut. Im Sattel durch Kordillere und Pampa Mittel-Patagoniens (Argentinien). Von Dr. W. Vallentin. 2. Auflage. 205 pp. Ills. Hermann Paetel, Berlin, 1912. 10 x 7.

Captain Vallentin is looking for good colonizing ground for Germans. In western Chubut he finds this as he did before in western Neuquen, and draws a vivid picture of the country. Dreary, arid wastes of little promise form the greater part of the province. Exceptions are the well-watered valleys among the Andes and three regions further east. Rio Senguerr in the south, the lands near Camarones on the coast where the deep gullies (cañadones) have water, and the flood-plain of the Chubut River, colonized by the Welsh since 1865. Floods are disastrous in this valley as in most of those in the west. Regulation works are possible in the Chubut valley with development of water power for an electric railroad. This is much needed, for the 300 miles of separation from the coast is the great handicap of the settlements in the Andine valleys, the most promising part of the land. They are producing grain, fruit, vegetables and cattle in abundance. With a market they could increase the output a hundred fold. Chile is much nearer than the Atlantic and Chileans figure largely among the settlers. The valleys are fertile and beautiful, the climate like Europe, but milder. The Argentine government

is slow to give title but in some places is granting one and a quarter square miles free to prospective citizens who will build a house and begin cultivation. With a railroad, prosperity will be immediate, and Captain Vallentin fears the *English* will build it. MARK JEFFERSON.

The Flowing Road. Adventuring on the Great Rivers of South America. By Caspar Whitney. 319 pp. Maps, ills., index. J. B. Lippincott Co., Philadelphia, 1912. $3. 9 x 6.

This book is a narrative of adventures on several rivers of South America, notably the Orinoco, with its tributaries, the Portuguesa, Apure and Casiquiare; the Rio Negro, of the Amazon system; and the Salado and Feliciano, of the Paraná system. Incidents of land trips in the llanos of Venezuela, forests of Brazil, and Argentine pampas, are also told briefly. There is a closing chapter on outfitting for jungle travel, which contains much sound advice.

The narrative deals chiefly with the interior of Venezuela, in the section where the Orinoco and Amazon tributaries interlock and are linked. The things told are the incidents of travel through a wild region, and the abundance of interesting items of natural history which the practical observer gathers in such a journey. Descriptions of the natives and their ways of living are perhaps the most valuable items among the many that are recorded. As a result, the reader is given a rather full idea of the conditions prevailing in the upper valleys of the Orinoco system. The pleasing style, for which the author is already well known, is found fully as effective here as in any of his other books. There are numerous good illustrations.

WALTER S. TOWER.

AFRICA

The Temple of Deudûr. Par Aylward M. Blackman. In series: Les Temples Immergés de la Nubie. Service des Antiquités de l'Egypte. 114 pp. Ills., indices. Imprimerie de l'Inst. Français d'Archéol. Orientale, Cairo, 1911. 348 piastres. 14 x 10.

This handsome volume, in which both the text and illustrations are by Mr. Blackman, is one of a special series brought out by the Department of Antiquities in Egypt. The studies comprised in that series are devoted to the description of temples a little south of Aswan which are threatened by the raising of the great dam. They are intended to be technical and exhaustive, so that even the more intelligent of winter tourists will scarcely care to attack them, but the professed Egyptologist will be grateful to the Government for the closeness and accuracy of its records.

Mr. Blackman is one of the younger Oxford Egyptologists, and had every reason to feel highly complimented when Sir Gaston Maspero selected him to execute this important work. He has performed his task with conscientiousness and care, and the volume is fully equal in quality to any of its predecessors. Of the 120 pages of photographic illustrations all come up to a relatively high standard, while many are conspicuously good. The hieroglyphic texts are well reproduced and the descriptive letterpress is skilfully interwoven with them. The printer has generally been kind, though the spelling "eface" and "sovran" show that his mastery of English was imperfect; and his choice of type for numerals was genuinely unfortunate. The inconsistency between the spelling of "Dendûr" in the letterpress and "Dandour" on the plates should also have been avoided.

The author takes every scene in the temple and describes it minutely, according to a set schematic form. Every inscription is reproduced in the conventional hieroglyphic transcription, a difficult and laborious task which those who have attempted it will appreciate. It needs a very highly trained and experienced scholar to detect the original readings on a blurred and worn stone. Even a Lepsius has made many a blunder, and the copies of more than one famous philologist are almost useless, so that the whole value of such work as this depends upon the personal qualifications of the individual. The present reviewer, who has spent many a day with Mr. Blackman under

the Nubian sun, is able to certify that his copies have been made with the greatest care, and the honors which this young student has already received from his University are a sufficient guarantee of his linguistic accomplishments.

D. RANDALL-MACIVER.

Through Timbuctu and Across the Great Sahara. An account of an adventurous journey of exploration from Sierra Leone to the source of the Niger, following its course to the bend at Gao and thence across the Great Sahara to Algiers. By Capt. A. H. W. Haywood. 349 pp. Map, ills., index J. B. Lippincott Co., Philadelphia, 1912. $3.50. 9 x 6.

The journey began at Freetown, and the first stage was made by the Sierra Leone R.R. to Pendembu; then followed the long trail to Gao, part of which was by caravan and part by river craft, and finally from Gao across the Sahara to Biskra by means of the camel. The second stage of the journey through the western Sudan was taken leisurely, and as the best hunting grounds of the trip were here, the book contains many accounts of the exploits of the sportsman. The chapters are full, too full in fact, of detail of every character: cotton growing, secret societies, marriage customs, bush fires, bird life, native music, tribal marks, superstitions, smuggling; so that the reader is turned first in one direction and then in another, with but a fleeting glimpse of each picture, until at the end he finds that while he has been highly entertained, he has no strong impression, as the result of his reading. The desert trip, a distance of nearly 1,600 miles, which was covered in seventy-five days, is more faithfully described.

ROBERT M. BROWN.

Notes on Some Languages of the Western Sudan, including 24 unpublished vocabularies of Barth, extracts, from correspondence regarding Richardson's and Barth's expeditions, and a few Hausa riddles and proverbs. By P. Askell Benton. viii and 304 pp. Oxford University Press, London, 1912. 7s. 6d. 7 x 5.

A most agreeable surprise lies within this little volume, a store of hitherto unpublished details of the expeditions of Richardson and Barth into Africa south of the Barbary States. The author has had the opportunity to ransack the state papers of the Record Office in London and has unearthed a very considerable mass of information which will be found extremely illuminative of the conditions of these expeditions. This will be found of particular value as filling in the gaps of Barth's narrative. At the time when his work was published there were reasons in external polity why some of his information should be withheld, but no attempt was made to preserve for future use this omitted material. These memoranda, many of them not intended for publication, contain much which it did not then suit the British authorities to allow to be made known. When applied to their proper places in Barth's narrative it will be seen that this new information is a valuable supplement.

The linguistic material varies widely in importance. It comprises more or less complete records of 172 words in twenty-four languages of inner Africa, and has hitherto never been accessible. Some of these languages have received more extended treatment by later explorers. Others have been overlaid by the recent encroachments of the trade language of the Hausa, and in the greater convenience of the latter the vernacular has become obsolete.

WILLIAM CHURCHILL.

ASIA

A Half Century Among the Siamese and the Lão. An Autobiography. By Daniel McGilvary. 435 pp. Map, ills., index. Fleming H. Revell, New York, 1912. $2. 8½ x 5½.

Here is no pretence of geographical record, a matter with which this pioneer missionary concerned himself not at all. But just because he was a missionary he felt called upon to pioneer along paths which led him to inner and north Siam, even to its border. Just because his journeys were filled with difficulty he was forced to observe the difficulties and the causes from which they arose, and when observed and accounted for they were recorded in his journals.

It was an odd turn of affairs which made so many of the earlier missionaries recorders of geography. Foreign missions were a new venture of faith; not wholly accepted by the churches, they had to prove their way; each missioner, therefore, was largely dependent for his support upon his ability to write an interesting account of his labors and the field in which they were prosecuted which might be read at the "monthly concerts" and thus win contributions for his cause. In this volume, summing up his half century of activity in Siam, Dr. McGilvary clung very sedulously to the text of his letters written while events were fresh. It results that the work must take immediate place as the fundamental record of our earliest knowledge of the formerly independent states which, under his observing eye, became the northern provinces of Siam. The sum of the strictly geographical information is remarkably large.

WILLIAM CHURCHILL.

The Japanese Nation, Its Land, Its People and Its Life. With Special Consideration to Its Relations with the United States. By Inazo Nitobé. xiii and 334 pp. Map, index. G. P. Putnam's Sons, 1912. $1.50. 8 x 5½.

No geographer, and still less no layman, should consider his judgment of the Japanese nation down to date and well balanced who has not read this unprejudiced volume. The author writes with a source of knowledge that is first hand, and presents his material with a flow of language that is of unusual literary merit and full of intensive meaning. There are twelve chapters representing as many lectures delivered in six American universities in 1911-12, during which period Dr. Nitobé was exchange professor in this country. While every chapter is worthy of special note, Chapter 5 on "Religious Beliefs" and Chapter 11 on "The Relation Between the United States and Japan" call for particular mention. Perhaps no phase of Japanese life is so universally misunderstood as the religious attitude. It is doubtful whether one can find a clearer exposition of Shinto and Buddhism in Japan, than in Chapter 5.

One lecture delivered at Leland Stamford Junior University, not included in the twelve, appears as an appendix, owing to the "local allusions" contained therein. An outline map of the Pacific Ocean and bordering lands, with sailing routes between American, Asiatic and Australian ports, follows the appendix. An index completes this valuable contribution to our study of the world's nations.

EUGENE VAN CLEEF.

The Sea Road to the East. Gibraltar to Wei-hai-wei. Six Lectures. By A. J. Sargent. vii and 124 pp. Maps, ills. George Philip & Son, Ltd., London, 1912. 1s. 7½ x 5½.

This little volume containing six lectures descriptive of critical points en route from the Mediterranean to China, and accompanied by a few photographs, is quite instructive. The photographs are reproductions of some of the lantern slides that have been prepared to accompany the lectures.

Because the text refers to slides not before the reader, some of the statements are not as clear as they might be. However, the vivid style offsets this handicap in most cases and the attention is held throughout. The discussions in general present excellent geographic material for the average lay reader. Of course advanced literary style and completeness of information are almost of necessity lacking; on the other hand, its simplicity of portrayal is in its favor.

An outline map of the world (with a photograph of Valetta on the reverse side) showing ocean routes from Europe to the Orient serves as a frontispiece.

EUGENE VAN CLEEF.

AUSTRALASIA AND POLYNESIA

Kaiser-Wilhelms-Land. Beobachtungen und Erlebnisse in den Urwäldern Neuguineas. Von Dr. Eugen Werner. xiv and 314 pp. Map, ills., index. B. Herder, St. Louis, Mo., 1911. $2.35. 9½ x 6½.

The strength of this valuable yet wholly unpretentious volume in its exposition of a field scarcely touched, lies in the vivacity of the author's obser-

vations. That which he has written is that which he has seen with his own eyes. The record is most convincing because so very graphic. Our knowledge of New Guinea, very scanty as yet in sum, has, till recently, been almost wholly confined to hurried sketches of its littoral. In our comprehension of folk movement along the guiding coasts of the great island the littoral must have been a place of admixture. We have established that earlier Polynesians and more modern Indonesians have left here their impress. The resultant product in biology, vegetal, human as well as other not distant animal, is a contamination of at least two alien elements upon a theoretically autochthonous base which for convenience we designate Papuan. But back from the coast a few difficult, indeed very difficult, miles primeval conditions are met. It is through those few miles that Dr. Werner has toiled. At once he is in an old world with new eyes to see that which has remained unchanged. Rumor has been, if not a sure guide in trackless country, at least the stimulus to his search. Thus from tales along the coast he was led to hunt in the rearward forest and at last to win his way to the habitat of the great butterflies, those giants of the *lepidoptera,* as large as birds and in brilliance rivaling the birds of paradise which share their forest home. The story of this hunt will interest the geographer quite as much as the result will engage the attention of the entomologist. The same vivacity characterizes his observation of plant life. In ethnography he somewhat hesitates—not a blemish in our present ignorance of the New Guinea folk and in the deadening obsession of the Malayo-Polynesian theory. Yet in brief word lists of Rumba, Kaliko, Damun and Mannam it is not difficult to evaluate marked differences in the Polynesian content.

WILLIAM CHURCHILL.

EUROPE

Alpine Studies. By W. A. B. Coolidge. xiii and 307 pp. Ills., index. Longmans, Green & Co., New York, 1912. 9 x 6. $2.50.

All lovers of the mountains will welcome this, the latest, volume from the pen of him who is perhaps the most widely known historiographer of the Alps now living. To those who are without access to a library of mountaineering periodicals, it will be a particular boon, for in "Alpine Studies" is presented a selection of seventeen articles which the author has published from time to time during the last forty-two years in the pages of the official organs of various English and Continental mountaineering societies, several of which are not generally available. In addition, there are three papers, "Tschingel," "The Name of Monte Rosa" and "A Driving Tour," that appear for the first time.

About two-thirds of the book is devoted to mountaineering proper. It opens with an account of the writer's early explorations (1878-9) in the Maritime, Cottian and Dauphiné Alps, which include the first ascent of Les Bans and the second of the Meije. This is followed by narratives of ascents of the Wetterhorn, Jungfrau and Schreckhorn in winter, some of the earliest climbs of the high peaks at this season. Next come descriptions of Grindelwald in winter, and then the scene of the story changes to the Dolomites, Swiss and Tyrolese. The section closes with an account of the author's dog, Tschingel, which had a record of no less than sixty-six snowy peaks and passes, including such mountains as the Jungfrau, Mönch, Eiger, Mont Blanc, Monte Rosa, Finsteraarhorn, etc.

In the succeeding division of the volume we have detailed historical studies of the St. Theodule Pass, of the names of Monte Rosa and the Matterhorn, and of the early attempts on the former from the Swiss side. Cervin, it appears, means "the very high peak," Matterhorn is taken from the name of Zermatt, while Rosa is simply the local patois for glacier.

The concluding section contains matter relating to the Swiss mountains below the snow line—a driving tour, walks, and wrestling. Thirteen of the sixteen full-page illustrations, excellently reproduced in half-tone, are from fine photographs by Signor Vittorio Sella. Two others are by the late W. F. Donkin. An unusually helpful feature is the comprehensive topographical description of each plate under the list of illustrations. H. PALMER.

History of Russia. By V. O. Kluchevsky. Translated by C. J. Hogarth. Vol. I. ix and 373 pp. Index. E. P. Dutton & Co., New York, 1911. $2.50. 8½ x 6½.

This first volume, rich in itself and full of promise for what is yet to come, brings us down to the fifteenth century in calendar and, in events, to the assumption of power by the Moscow principality and the fall of the free commonwealths in the subjection of Nizhni-Novgorod by the Muscovite Ivan III. Prof. Kluchevsky is so keen in the analysis of events, in the ferreting out of their conditions precedent and their ultimate results, so devoted to a commendable philosophy of Russian history, that he has largely neglected keeping count of the time of these events, and chronometry is really necessary to a proper comprehension of any history. Even without the time he has succeeded in making clear—and this is the first time that the matter has been satisfactorily explained to the non-Russian reader—the tangle of the succession of the descendants of Yaroslav as princes suzerain of Kiev. With the regular succession on the one hand and the succession of appanage on the other he joins a clear setting forth of the essential difference of the life of the community in Kiev and Moscow, making it plain that as the former was a great mart for trade with Byzantium the irruption of Asiatic hordes athwart the trade route brought about the decadence of Kiev. The work is worthy of a better translation. This English version is frequently obscure, much of it suggests rendering through a possible German or French version. Other faults, however, lie in the English itself. The verb "to adumbrate" is overworked, scarcely once in many times of employment does it fit the sense. On page 354, in discussing the regional quarrels of Novgorod, a matter in which the whole history of the great free commonwealth is bound up, this English version impossibly attributes to Prof. Kluchevsky the statement "enmity between the aristocratic Sophiskaia Storona and the democratic Sophiskaia Storona," whereas it is notorious that the democratic, often turbulent, storona of Novgorod was the Torgovaia.

WILLIAM CHURCHILL.

POLAR

Meteorologische Beobachtungen der schwedischen Südpolar-expedition. III: Zusammenfassung der allgemeinen meteorologischen Resultate sowie Beobachtungen während der Schlittenfahrt 30. Sept.–4. Nov. 1902. Bearbeitet von Gösta Bodman. 159 pp. Diagrams. Wissenschaftl. Ergebnisse, Schwed. Südpolar-Exped., 1901–03, unter Leitung von Dr. Otto Nordenskjöld, Vol. 2, Lief. 4, Lithogr. Inst. des Generalstabs, Stockholm, 1910. 11 x 8.

A very rich harvest has been gathered from the meteorological observations taken on the numerous Antarctic expeditions of the past ten or a dozen years. And still the results keep coming in. The Swedish South Polar Expedition of 1901-03, under the direction of Dr. Otto Nordenskjöld, made a very valuable contribution to this rapidly increasing Antarctic meteorological literature. The fourth part of Vol. II of the scientific results of this expedition contains a summary of the meteorological work, together with the observations taken on the sledge journey of September 30-November 4, 1902, prepared by G. Bodman. The summaries are compact and clear; the data are discussed very fully, and there is a welcome comparison of the Swedish results with those obtained on the other recent expeditions. There are many curves, but those which will certainly have the most general interest are thirty-six plates showing, in facsimile, the barograph, thermograph and hygrograph curves, and a graphic presentation of the wind data, for thirty-six weeks. This is a veritable treasure-house of information concerning Antarctic meteorology. The station (Snow Hill) was on the equatorial side of the Antarctic Circle, but the character of the weather was such that there is no doubt about its being a pure Antarctic type, with very cold summers and prevailing winds from practically only two (opposite) directions. The text calls attention to some of the more characteristic features of these curves, but there is a great deal of interesting material here, awaiting patient investigation.

R. DEC. WARD.

ANTHROPOGEOGRAPHY

The Rubber Industry. Being the Official Report of the Proceedings of the International Rubber Congress, London, 1911, etc. Edited by Dr. Joseph Torrey and A. Staines Manders. 470 pp. Ills. International Rubber & Allied Trades Exhibition, Ltd., London. 15s. 6d. 10 x 6½.

This official report of the proceedings of the International Rubber Congress, held in London in 1911, contains the papers presented at that time, together with the discussions which they caused. Among the topics of these papers the following appear to be most important: An introductory historical sketch traces the development and spread of rubber production, and mentions all the important ports exporting raw rubber. The problems arising on rubber plantations, as labor and health, are discussed for Cochin China, Ceylon, Madagascar, Uganda, West Africa, Brazil, Peru and the West Indies. In several cases, however, the discussions appear to be rather sketchy "reports of progress." Numerous questions on the technical side of the industry, as problems in the preparation of latex, in vulcanizing, etc., are covered quite fully. The discussion of the world's trade in raw rubber is almost worthless, because incomplete, while a short paper on the factors affecting the valuation of "rubber shares" is decidedly interesting.

From the geographic standpoint, however, the most interesting paper is that entitled "Maintenance of Health in Rubber-planting Districts," presented by W. C. Brown, M.D., of the Royal College of Physicians, London. A few typical statements throw some light on the problem of acclimatization. Most rubber estates are described as "insalubrious," and to remain well, "intelligence and constant vigilance are required." But, if one is "careful about what he eats, and especially about what he drinks," assuming that he is a "picked man" "absolutely fit and well," not "too fleshy," "without any tendency to nervous diseases or insanity . . . alcoholism or tubercles," with all organs "sound, the heart especially," there is no reason why an assistant on a rubber estate in the tropics should not be as healthy as "on a farm in Yorkshire." Yet "immunity to the effects of the tropical sun is very rare in Europeans." WALTER S. TOWER.

Questions Coloniales (1900–1912). Par Charles Régismanset. 272 pp. Index. Émile Larose, Paris, 1912. Frs. 3.50. 7½ x 4½.

These are the essays which a shrewd student of French colonial development has evolved in the course of the last dozen years, each one communicated to the periodical press while the subject was fresh, the collection now made up into a volume. Some of the themes most hotly debated at the time when the individual essays were penned have been settled by the course of natural growth, some have fallen back into a place of relative insignificance, others have been disposed of by administrative action at times in accord with the author's suggestion. In general, it is to be said that the work lacks the vivid quality which must find its only spring in intimate personal acquaintance with colonial life in the tropics. The author views the French world overseas from the metropolis, his essays are not so much colonial as critical of the attitude of the Ministry of Colonies and the national legislature toward colonies.

Thus these papers are essentially occasional, in fact *ex parte;* yet not on that account are they to be held the less valuable, for they preserve in convenient record the thought of a careful student filled with zeal for the growth of a greater France. As such they possess not only a present interest but will serve as valuable contemporary memoranda at some later period when the fortunes of the new French colonial empire passes under critical review of historians. WILLIAM CHURCHILL.

Aux Colonies, Impressions et Opinions. Par Ch. Hoarau-Desruisseaux. 375 pp. Émile Larose, Paris, 1911. Frs. 3.50. 7½ x 4½.

The cause of the voyages which have led to this delightful book lies in the author's strict devotion to his duty of inspecting the tropical colonies of France. But the pleasure of the work lies in his keen zest of appreciation of

the oddities of life and his brave determination that no mere officialism shall prevent his record of the best stories which his voyages have produced. It is to this that we owe our knowledge of the great effect produced in French Africa by the red morocco boots of a visiting Minister of Colonies. To the same zeal we owe our first intimation of sad events which happen in the Bronx "Zoo". All French colonies are divisible into such as have snakes and such as have none. A keeper—this is told on page 303—wishing to feed the boa constrictor, was seized by the monster and at once wrapped in his coils. He would have perished unpitiably without the effort of fifteen men who ran to his assistance and unwrapped him, not without suffering, from the terrible pressure. Yet we hasten to remark that in the heart of this charmingly discursive tale are four chapters which are quite the best we have seen on the topic, those which deal with the foods of the French colonies, the cost of living, the dwellings which colonial settlers should dwell in and the varied products of the soil. WILLIAM CHURCHILL.

PHYSICAL GEOGRAPHY

The Structure of the Atmosphere in Clear Weather. A Study of Soundings with Pilot Balloons. By C. J. P. Cave. xii and 144 pp. Maps, ills., index. G. P. Putnam's Sons, New York. University Press, Cambridge, 1912. 10s. 6d. 11 x 9.

Only a few years ago the use of such a sub-title as "A Study of Soundings with Pilot Balloons" in a monograph dealing with a meteorological subject would have been impossible. "Soundings" of the free air, and "pilot balloons" are developments of yesterday. To-day, almost every month brings to the reviewer's desk some new publication dealing with the results of free air studies. One of the most recent of these publications is a careful study of the results of 200 pilot balloon ascents from Ditcham, on the South Downs of England, by C. J. P. Cave, whose name is already well known in connection with such work. The methods of work are described in detail. The data are tabulated for all the ascents, and diagrams are given for about fifty cases. The vertical distribution of wind directions on several different ascents is very clearly illustrated by means of photographs of models in which, for various altitudes, the wind directions are actually shown by means of arrows, mounted one above the other on a vertical rod. This method seems to us singularly effective, and withal very simple. It would serve admirably for use in the classroom. Mr. Cave has classified the types of the varieties of structure observed in the atmosphere, and has presented, clearly and systematically, his facts and conclusions. It should be remembered by those students of meteorology—if there be any such—who still prefer to confine their attention to the earth's surface rather than to ascertain what is known regarding the free air, that recent researches have tended to show that changes of pressure originate at considerable elevations above the surface, and that therefore the knowledge of the structure and conditions of the atmosphere in the region just below the stratosphere is very important in our studies of the surface pressures and of weather. R. DEC. WARD.

Geodesy. Effect of Topography and Isostatic Compensation upon the Intensity of Gravity (second paper). By William Bowie. 28 pp. Maps. *Special Publication No. 12*, Coast and Geodetic Survey, 1912.

This publication of the Coast and Geodetic Survey supplements a report with the same title by Hayford and Bowie which appeared early in the year and which described in detail the Hayford (or New) method of making gravity reductions for the topography of the earth and its isostatic compensation. It gave the necessary tables for making the reductions and also the results obtained for eighty-nine gravity stations in the United States and sixteen stations not in this country.

The "Second Paper" is a report on all of the stations in the United States, 124 in number, and ten stations in Alaska.

In computing the effect of topography and its compensation upon the intensity of gravity at a station each portion of the earth's crust was assumed to

be in a state of perfect isostasy, with the compensating deficiency of mass under land areas and the excess of mass under ocean areas, uniformly distributed to the *depth of compensation*, which, as derived from astronomic and trigonometric data, is 113.7 kilometers below sea level. This is equivalent to the assumption that each unit column, extending from the surface to a depth of 113.7 kilometers below sea level, at the coast, in the interior, or in the ocean, has the same mass. The results of the investigation showed that on an average this condition is near the truth, but there are small anomalies at the different stations which show slight local deviations from the ideal condition.

The report shows that the Hayford anomalies do not indicate any appreciable relation to the topography and in this they differ from the older method of reduction now in general use in other countries. It is now possible to compute the theoretical value of gravity at any point in the United States (and possibly in other countries) with an even chance of its being within about .020 dyne of the value which would be obtained from pendulum observations at that point. This is one of the important results of the investigation. It is not possible, in such a brief note, to do more than to call attention to the matter contained in this report which should be of interest to scientists in general, but especially to the geodesist, geologist, and seismologist.

W. Bowie.

TEXT BOOKS

Die Erklärende Beschreibung der Landformen. Von William M. Davis. Deutsch bearbeitet von Dr. A. Rühl. xviii and 565 pp. Ills., index. B. G. Teubner, Leipzig, 1912. 9½ x 6½.

Among the results of Professor Davis's service at the University of Berlin as Harvard's representative in the German Visiting Professorship for 1908-09, must now be reckoned the publication of this masterly presentation of his ideas on the explanatory description of land forms. The book is dedicated to two Universities—Harvard and Berlin—and is based on the lectures delivered at Berlin. The general plan of treatment and the essence of the subject-matter are already familiar to American students of physiography; but we have here for the first time a fairly complete, systematic treatment of the subject, of much more advanced grade than that found in the author's "Physical Geography." Many teachers who have had to refer students to scattered articles for such treatment in the past, will wait with impatience the appearance of this, or a similar book, in English.

After an author's preface and a reprint of his inaugural address at Berlin, we are introduced to the work proper by a discussion of the essence of geography. The next chapter, "The Erosion Cycle," begins with a consideration of methods of geographical study and research, and ends with practical suggestions for the making of geographical diagrams. The cycle of normal erosion is elaborated deductively, the author giving, with the aid of diagrams, the general features which theoretically should characterize its different stages. Then follows a chapter in which the deduced features are tested by confronting them with facts observed in the field, numerous European and American examples of normal erosion forms being described and figured. A further elaboration of the deductive scheme follows, including some account of the different structures upon which erosion operates, of the different processes by which land masses are worn down, and of the effects consequent upon interruptions of a cycle of erosion.

About one-third of the volume is devoted to the foregoing considerations. A somewhat smaller amount of space is given to an elaboration of the forms produced by the dissections of plains, plateaus, mountains and volcanoes; while the remainder of the volume deals with the arid, glacial and marine cycles of erosion, closing with a full index.

Each chapter is followed by an appendix containing practical exercises for the student and by a list of references cited by the author. Block diagrams are used profusely, and add greatly to the value of the book. Photographic illustrations are limited in number, but are well chosen and beautifully reproduced. We may congratulate ourselves that the methods of the American school of physiography are so well presented to German students.

D. W. Johnson.

Lehrbuch der Geologie. Von Dr. Emanuel Kayser. 4. Auflage. 1. Teil: Allgemeine Geologie. xii and 881 pp. Ills., index. 2. Teil: Geologische Formationskunde. viii and 798 pp. Ills., index. Ferdinand Enke, Stuttgart, 1912. 10 x 7 each.

The rapid progress of geological science, as well as the painstaking conscientiousness of the author, is revealed by the fact that, two years after the publication of the previous edition of this book, hardly a page has remained unchanged in this fourth edition. In the volume on historical geology, these changes concern mostly the Cretaceous, Tertiary and Quaternary formations, among the latter the chapter on primitive man especially having been entirely rewritten. A number of paleo-geographical charts have also been inserted, to show the variations in the distribution of land and water at different geological periods, illustrated by the example of North America. The author emphasizes, however, that such charts are valuable only as representations of comparatively small areas and short periods, because the actual duration of any one formation was so long that it would be impossible to represent on one map the many geologico-geographical conditions which must have occurred during that time.

In general geology, the most important changes and additions refer to ripple marks, decomposition of silicate rocks, landslides, geysers, marine sedimentation, processes of mountain formation, and endogenous formation of rocks. A chapter on geological chronology, and another on the formation of marine facies, were added. Speaking of ripple marks, the author has discarded the accepted theory according to which they are considered to be formed by wave action, and accepted another first worked out by Hahmann, of Bonn, who explains them as a result of the friction of two mediums, one of which flows on top of the other, such as water, or air, on sand, or mud, or snow, etc. The chapter on mountain formation, and especially on regional metamorphism, has been entirely rewritten. The author divides the topographical forms into "Schwellformen" and "Hohlformen" e. g. raised forms, and hollow forms. Among the latter the great oceanic basins stand first; among the former, the continental blocks. In the second place are found, among the hollow forms, the lowlands and depressions of the continents; among the raised forms, table lands and large mountain ranges. To a third category belong the smaller depressions, troughs and valleys and the smaller mountain chains and single mountains, respectively.

The forms of the third and second categories are attributed to the competitive efforts of two classes of forces: the exogenous (water, ice, wind, etc.), which work for decomposition and leveling, and the endogenous, of volcanic or tectonic character, which strive to destroy the level by raising or depressing the surface. Among the chapters devoted to special problems, the one on the Alps is again full of new contributions to the subject, and has been enriched by a number of diagrams drawn by the master hand of Professor Heim. The double fold of Glarus has disappeared for good, and the recumbent fold theory is becoming better and better proven by recent investigations.

In the chapter on metamorphism, too, the work of Heim forms the basis of the discussion; but is it ably supplemented by the material contained in Van Hise's Treatise on Metamorphism. This is probably the first transcription, for the German student, of the work of the eminent American geologist, for which many readers will feel obliged to the author. In this, as in other respects, the book has the merit of being up to date in a way which cannot easily be surpassed, and which makes one wish that he might be favored with a new edition of it every two years. The number of illustrations, which are another special feature of this textbook, has again been enlarged.

M. K. GENTHE.

Commercial Geography. General and Regional. By J. F. Unstead and E. G. R. Taylor. viii and 238 pp. Maps, index. George Philip & Son, Ltd., London, 1911. 2s. 6d. 7½ x 5.

Based upon the larger *General and Regional Geography* by the same authors. The book in appearance and mechanical makeup has the usual

characteristics of English geographical textbooks—small size, narrow margins, opaque and unglazed paper, sketch maps and free use of bold face type for purposes of emphasis. Ten per cent. of the space is given to climate, vegetation and natural regions; twenty per cent. to industries and products, and the rest to regions of the world. The book is for use in schools of the British Empire and naturally stresses the geography of the British Isles and colonies. Germany receives 6 pp., Russia 5, the United States 9 and Japan 2. The causal idea is recognized but can not be emphasized in the limited space. The constant use of an atlas is advised and expected; the book contains no colored maps. Statistics are avoided, diagrams, curves and other graphic methods of showing quantitative facts are omitted. It has the virtue of compactness and rational treatment but for American schools would not do so well as our own modern commercial geographies. R. H. WHITBECK.

A Junior Geography of Scotland. Regional and Practical. By David Frew. 96 pp. Maps. Blackie & Son, Ltd., London, 1912. 1s. 7½ x 5½.

This textbook, somewhat more advanced than the Elementary Series, follows the same general plan. Approximately one-half is given to the physical features and climate and the remainder gives a description of the people, commerce and products. A few pages of review exercises close the volume. Well designed maps and diagrams are so used that they form an integral part of the text. Geology is developed much more than in American textbooks and the brief description of physiographic provinces and their origin is a commendable feature. F. V. EMERSON.

OTHER BOOKS RECEIVED

AMERICA

ILLUSTRATED KEY TO THE WILD AND COMMONLY CULTIVATED TREES OF THE NORTHEASTERN UNITED STATES AND ADJACENT CANADA. Based primarily upon Leaf Characters. By J. Franklin Collins and Howard W. Preston. vii and 184 pp. Ills., index. Henry Holt & Co., New York, 1912. $1.35. 6½ x 4½. [A handy guide to the wild and commonly cultivated trees of the region indicated.]

EDWARD FITZGERALD BEALE. A Pioneer in the Path of Empire. 1822-1903. By Stephen Bonsal. xii and 312 pp. Ills., index. G. P. Putnam's Sons, New York, 1912. $2. 9 x 6. [The biography of an American whose deeds exerted a civilizing influence in the West. With sidelights on pioneer days.]

THE OREGON SYSTEM. The Story of Direct Legislation in Oregon. By Allen H. Eaton. ix and 195 pp. Index. A. C. McClurg & Co., Chicago, 1912. $1. 8 x 5½. [Contains facts of value to the student of political science.]

THE DEEP WATERWAY. Between the Great Lakes and the Gulf of Mexico. Development of the Deep Waterway in Relation to Conservation. 49 pp. Maps. Lakes-to-the-Gulf Deep Waterway Assoc., St. Louis, Mo., 1911. 10 x 8. [The reasons advanced by members of this association, for the furtherance of their project.]

HISTORIA DEL PARAGUAY escrita en francés por el P. Pedro Francisco Javier de Charlevoix de la Compañia de Jesús con las anotaciones y correcciones latinas del P. Muriel. Traducida al castellano por el P. Pablo Hernández de la Misma Compañia. Tomo 2. Libreria General de Victoriano Suárez. Madrid, 1912. 8 x 5. [The twelfth volume of the "Colección de Libros y Documentos referentes á la Historia de América." Large detail.]

AFRICA

EN TRIPOLITAINE. Voyage à Ghadamès. Suivi des Mémoires du Maréchal Ibrahim-Pacha. Préface de M. Duparc. ix and 265 pp. Map, ills. Fontemoing et Cie, Paris, 1912. Fr. 7.50. 10 x 6½.

La Question Indigène dans l'Afrique du Nord. Par J. A. Ordioni. 2ème Partie. La Conquête des Indigènes. viii and 110 pp. Arnon Calmus, Auxerre, 1911. 9 x 5½. [An inquiry into the means of promoting the welfare of the negroes in the French possessions of Northern Africa.]

Wissenschaftliche Ergebnisse der Deutschen Zentral-Afrika-Expedition 1907-1908, unter Führung Adolf Friedrichs, Herzogs zu Mecklenburg. Vol. 3. Zoologie I. Herausgegeben von Dr. H. Schubotz. xxiii and 560 pp. Map, ills. Klinkhardt & Biermann, Leipzig, 1912. 10½ x 7½.

ASIA

China and the Manchus. By Herbert A. Giles. viii and 148 pp. Map, ills., index. G. P. Putnam's Sons, New York, 1912. 40 cents. 6½ x 5. [A glimpse of Chinese history with special reference to the influence of the Manchus from their rise to power to their recent dethronement.]

Træk af Vegetationen i Transkaspiens Lavland. By Ove Paulsen. 238 pp. Map, ills. Gyldendalske Boghandel, Copenhagen, 1911. Kr. 19. 10 x 6½. [A systematic investigation of the flora of the region immediately east of the Caspian Sea.]

EUROPE

Tidvattnen. 1: Östersjön och Finska Viken. Af Rolf Witting. 84 pp. Deutsches Referat: Die Gezeiten der Ostsee und des Finnischen Meerbusens. Fennia 29, No. 2, Helsingfors, 1911. [An application of the so-called harmonic analysis to the investigation of tide phenomena in seven localities in the Baltic Sea.]

A Short History of Scotland. By Andrew Lang. viii and 344 pp. Index. Dodd, Mead & Co., New York, 1912. $2. 8 x 5½. [A condensed history of events in Scotland from the days of the Roman occupation to and including the last Jacobite rising.]

La France. Géographie illustrée. Par P. Jousset. Tome 1. 390 pp. Maps, ills. Librairie Larousse, Paris, 1912 (?) 13 x 10. [A description of France, based on the geography of the country. Maps and photographic views in profusion.]

La France Pittoresque du Midi. Histoire et Géographie des Provinces d'Auvergne, de Gascogne, Béarn, Foix, Languedoc, Roussillon, Comtat, Nice, Provence, Corse et des Départements qu'elles ont formés. Par Alexis-M.G. 367 pp. Maps, ills. Alfred Mame et Fils, Tours, 1912 (?). 11 x 7½. [Descriptive geography of Southern France. With historical notes.]

Old Paris. Its Social, Historical and Literary Associations. Including an Account of the Famous Cabarets, Hôtels, Cafés, Salons, Clubs, Pleasure Gardens, Fairs and Fêtes, and the Theatres of the French Capital in Bygone Times. By Henry C. Shelley. xii and 354 pp. Ills., index. L. C. Page & Co., Boston, 1912. $3. 8½ x 6. [Explains the fascination of Paris to the foreigner as well as its attractiveness to the native.]

Austria. Sein und Werden unseres Heimatstaates. Von F. J. Graf von Silva. II: Topographie. 100 pp. Wilhelm Frick, Leipzig, 1912. Mks. 3. 9½ x 6. [A brief but comprehensive survey of the surface aspects of Austria-Hungary.]

Les Chemins de Fer Kassa-Oderberg et la Haute-Tátra. Album de la Haute-Tátra. Le trafic des chemins de fer priv. Imp. Roy. Kassa-Oderberg dans la Haute-Tátra avec 7 tableaux coloriés et vingt-six gravures sur bois d'après les aquarelles de E. T. Compton. Kassa-Oderberg Railway Co., 1912. 17 x 13.

Le Provincie d'Italia sotto l'Aspetto Geografico e Storico. Regione Umbra. Provincia di Perugia. Por M. Pierfelici Locci. 71 pp. Maps. ills. G. B. Paravia e Comp., Rome, 1912. Cent. 70. 8 x 5. [A brief description of the province of Perugia and its development from early times to the present day.]

HISTORICAL

The Revolutions of Civilisation. By W. M. Flinders Petrie. xi and 136 pp. Ills., index. Harper & Brothers, New York, 1911. 75 c. 7 x 4½. [An account of the progress of the conception of civilization and its manifestations.]

Der Mythus von der Sintflut. Von Georg Gerland. 124 pp. A Marcus

und E. Weber, Bonn, 1912. Mk. 3. 9 x 6. [The various versions of the Deluge are reviewed as they exist in different portions of the world.]

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

System Followed in Listing Maps.

Title. As on original, if possible. If lacking or incomplete, necessary matter enclosed in brackets.

Scale. Natural (unless otherwise on original). If no scale on original, approximate scale enclosed in brackets.

Coordinates. Approximate limiting coordinates of map given except when region explicitly defined by title. Where map-net lacking, coordinates, if possible of determination, given in brackets. All meridians referred to Greenwich. If map not oriented N., orientation given.

Colors. Number of tints of separate symbols, not number of color printings given. Black or basal color not considered a color.

Source. If map separately published, name of institution issuing it, place and date given. If a supplement, title of paper or book, author, periodical, volume, number, year and pages given.

Comment. Descriptive and critical. In brackets.

Regional Classification. Major political divisions the unit, as a rule, except for United States and Canada. Boundaries of continents according to Siever's *Länderkunde*, Kleine Ausgabe.

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. COAST AND GEODETIC SURVEY

Atlantic Coast

Court House Point to Augusta, Kennebec River, Maine. 1:15,000. [Two maps:] (1) 44°19.8′ - 44°13.0′ N.; 69°48.0′ - 69°45.2′ W. (2) 44°13.3′ - 44°6.4′ N.; 69°47.3′ - 69°44.5′ W. 1 color. Chart No. 289. Oct. 1912. 25 cts.

Abagadasset Point to Court House Point, Kennebec River, Maine. 1:15,000. 44°6.8′ - 44°0.0′; 69°50.2′ - 69°44.5′ W. 1 color. Chart No. 288. Oct. 1912. 25 cts.

[Charts Nos. 289 and 288 are reduced from former Charts Nos. 316b and 316a, on the scale of 1:10,000, with the omission, however, of the valuable representation of culture, especially noticeable in the towns, Augusta, Hallowell, Farmingdale, Gardiner, etc.]

Cape Elizabeth to Kennebunkport, Maine. 1:80,000 43°35.6′ - 43°10.0′ N.; 70°36′ - 69°53′ W. Oriented N. 25° W. Chart No. 107a. Nov. 1912 20 cts.

Block Island Sound and Approaches, Rhode Island-Connecticut-New York. 1:80,000. 41°23′ - 40°40′ N.; 72°15′ - 71°28′ W. 1 color. Chart No. 1211. July 1912. 50 cts.

Cape May to Fenwick Island Light, New Jersey-Delaware. 1:80,000. 39°1′ - 38°27′ N.; 75°11′ - 74°20′ W. 1 color. Chart No. 1219. Aug. 1912. 50 cts.

Fenwick Island Light to Chincoteague Inlet, Maryland and Virginia. 1:80,000. 38°29′ - 37°48′ N.; 75°27′ - 74°43′ W. 1 color. Chart No. 1220. Oct. 1912. 50 cts.

Chincoteague Inlet to Hog Island Light, Virginia. 1:80,000. 37°56′ - 37°23′ N.; 75°50′ - 74°55′ W. 1 color. Chart No. 1221. July 1912. 50 cts.

Wolf Trap to Smith Point, Chesapeake Bay, Virginia. 1:80,000. 37°56′ - 37°23′ N.; 76°31′ - 75°39′ W. 1 color. Chart No. 1223. Oct. 1912. 50 cts.

[In part replaces former Chart No. 132.]

Pacific Coast

Southern part [of] Cook Inlet, South Coast [of] Alaska. [Mercator's projection: mean meridional scale 1:200,000.] 60°16′ - 58°50′ N.; 154°22′ - 150°48′ W. 1 color. Chart No. 8554. Sept. 1912. 50 cts.

[Chart of northern part of Cook Inlet listed under "Pacific Coast" (first entry), *Bull.*, Vol. 44, 1912, p. 636.]

Dolgoi Island to Deer Island, Alaska Peninsula. 1:80,000. 55°19.0′ - 54°49.5′ N.; 162°44′ - 161°38′ W. 1 color. Chart No. 8703. Oct. 1912. 50 cts.

Hawaiian Islands

Oahu to Niihau. [Mercator's projection: mean meridional scale 1:250,000.] 22°40′ - 20°56′ N.; 160°34′ - 158°6′ W. 1 color. Chart No. 4117. Aug. 1912. 50 cts.

[Shows Kauai and Niihau Islands, not included hitherto on the charts of the Survey.]

Philippine Islands

Verde Island Passage, West Coast of Luzon. [Mercator's projection: mean meridional scale 1:132,000.] 14°15′ - 13°24′ N.; 120°23′ - 121°26′ E. 1 color. Chart No. 4214. Aug. 1912. 50 cts.

Lamon Bay and Polillo Island, East Coast of Luzon. [Mercator's projection: mean meridional scale 1:200,000.] 15°15′ - 13°53′ N.; 121°25′ - 123°0′ E. 1 color. Chart No. 4226. July 1912. 50 cts.

NORTH AMERICA.

MEXICO-UNITED STATES. Map Showing Papago Rancherias, Present and Past. By Carl Lumholtz. Drawn by A. Briesemeister. [1:1,000,000.] 33⅓° - 29½° N.; 115⅙° - 110 ⅚° W. Accompanies, in pocket, "New Trails in Mexico" by C. Lumholtz, New York, 1912.

[A map supplementary to the listed under "United States-Mexico" in *Bull.*, Vol. 44, 1912, p. 797. It distinguishes between rancherias, *temporales* (summer rancherias), abandoned rancherias and former camps of the Sand Papago Indians. Outlines of sierras shown.]

MEXICO-UNITED STATES. (a) Sketch Map of part of Sonora and Arizona to illustrate the paper by Dr. Carl Lumholtz. 1:2,000,000. 33⅔° - 30° N.; 115⅔° - 110° W. 1 color. With inset, 1:60,000,000, showing location of main map.

(b) Sketch Map of Part of Sonora and Arizona to illustrate the paper by I. N. Dracopoli, F.R.G.S. 1:3,000,000. 33⅔° - 30½° N.; 115⅔° - 110° W.

Accompany, map (a) as a supplement and map (b) on p. 513, "The Sonora Desert, Mexico," by C. Lumholtz and I. N. Dracopoli, *Geogr. Journ.*, Vol. 40, No. 5, 1912, pp. 503-511 and 511-518, respectively.

[Map (a) deals with same region and same expedition as the map from Dr. Lumholtz's "New Trails in Mexico" (listed under "United States—Mexico" in *Bull.*, Vol. 44, 1912, p. 797), without, however, being so complete or so accurate. Map (b) similar to that listed under "Mexico" in *Bull.*, Vol. 44, 1912, p. 316. For other representations of this region see also the maps facing pp. 22 and 110 of "Camp-Fires on Desert and Lava" by W. T. Hornaday, New York, 1908.]

SOUTH AMERICA.

ARGENTINA—CHILE. Sketch Map to Illustrate the Paper on "Recent Surveys in Northern Patagonia" by Bailey Willis, 1912. 1:6,000,000. 38° - 44° S.; 75° - 61° W. Accompanies, on p. 609, paper as indicated, *Geogr. Journ.*, Vol. 40, No. 6, 1912, pp. 607-615.

[Embraces the territory to be opened up by the proposed second trans-Andine railroad from Port San Antonio at the head of the Gulf of San Matias (40¾° S.) to Valdivia, Chile, for which the surveys are being made under the direction of Bailey Willis of the U. S. Geological Survey by an Argentine commission which, in keeping with an historical analogy, may not inappropriately be termed the Forty-First Parallel Survey of South America.]

CURAÇAO. Kaart van het Stadsdistrict van het eiland Curaçao. In 1909 opgenomen door J.V.D. Werbata. 1:5,000. [12°6′ N. and 68°57′ W.] 5 colors. (Departement van Openbare Werken, Curaço). In two sheets.

[Excellent plan of Willemstad showing the built-up area of the town, distinction being made between stone and wooden houses. Relief in contours; interval 5 meters.]

AFRICA

ABYSSINIA. Routes in South-Western Abyssinia from Plane-table and Prismatic Compass Traverses by George Montandon, M.D. 1910-11. 1:750,000. 9°3′ - 6°30′ N.; 34°28′ - 38°52′ E. 3 colors. With two insets: (1) Plan of Gore. 1:50,000. [8°9′ N. and 35°32′ E.] 2 colors. (2) [Map of northeastern Africa showing Dr. Montandon's route.] 1:12,000,000. 16° N. - 0°; 28° - 52° E. 3 colors. Accompanies "A Journey in South-Western Abyssinia" by G. Montandon, *Geogr. Journ.*, Vol. 40, No. 4, 1912, pp. 372-391.

[Valuable route survey of the hitherto little known southwestern portion of the Ethiopian Plateau draining into Lake Rudolf and the Sobat River. Drainage in blue, relief in approximate contours in brown (interval 500 ft.) and route in red.]

ANGLO-EGYPTIAN SUDAN, ETC. Sketch of the Pibor River to illustrate the papers by Capt. H. D. Pearson, R.E., and Capt. H. H. Kelly, R.E. 1:3,000,000. 8¾° - 4° N.; 31½° - 34½° E. Accompanies, on p. 489, "The Pibor River" by H. D. Pearson and H. H. Kelly, *Geogr. Journ.*, Vol. 40, No. 5, 1912, pp. 486-501.

[Results of a military reconnaissance in the hitherto little-known region between the Bahr el Jebel and the upper tributaries of the Sobat River, adjacent to that shown on the map listed under "Abyssinia".]

MOROCCO. Die Verbindungen zwischen Fes, Taza und dem Wadi Muluya. Entworfen von M. Hübner. 1:1,250,000. [34°42′ - 33°48′ N.; 5°5′ - 2°48′ W.] Accompanies, on p. 182, "Die Verbindung vom Wadi Muluya nach Taza" by M. Hübner, *Pet. Mitt.*, Vol. 28, II, Sept. 1912, pp. 181-184.

MOROCCO. (a) Der französische Stützpunkt Colomb-Béchar, der Endpunkt der westalgerischen Grenzbahn. 1:100,000. [31°37′ N.; 2°13′ W.]

(b) Die Oase Bu-Denib, äusserster französischer Posten gegen den Hohen Atlas. 1:36,000. [32°0′ N. and 3°40′ W.]

(c) Die Verbindungswege zwischen der Schauja und der Oase Bu-Denib im Girtal. 1:3,500,000. [33°10′ - 31°45′ N.; 7°20′ - 3°40′ W.]

Accompany, on pp. 55, 56 and 57, "Die Verbindung vom Wadi Muluya zum Umer Rbia in Marokko" by Hübner, *Pet. Mitt.*, Vol. 58, II, July, 1912, pp. 55-58.

TRIPOLI. Sketch Map Showing the route followed by M. Georges Rémond in Tripoli and Cyrenaica. 1912. 1:7,500,000. 34° - 27⅓° N.; 10° - 26° E. Accompanies, on p. 535, note on "A Recent Journey in Tripoli and Cyrenaica", *Geogr. Journ.*, Vol. 40, No. 5, 1912, pp. 532-537.

[Journey led along the whole length of the seaboard of Tripoli from the Tunisian to the Egyptian frontier, a stretch which, it is believed, has been covered in its entirety by no traveler since Barth (1846).]

WEST AFRICA. The "African World" Map of West Africa. By Alexander Gross. [1:6,000,000.] 16°30′ - 2°0′ N.; 17°0′ W. - 17°30′ E. 5 colors. "Geographia" Designing & Publishing Co., Ltd., 33 Strand, London, [1911.]

["Situation" only. Compiled for "Colonial West Africa" guide book of Elder Dempster S. S. Co.]

ASIA

CHINA. Major G. Pereira's route to the Labrang Monastery. 1:4,000,000. 37° - 34½° N.; 100° - 104⅓° E. With inset, 1:32,000,000, showing location of main map. Accompanies, on p. 417, "A Visit to Labrang Monastery, South-West Kan-su, North-West China" by G. Pereira, *Geogr. Journ.*, Vol. 40, No. 4, 1912, pp. 415-420.

CHINESE EMPIRE, ETC. Central Asia: Sketch Map Showing the Route from Kashgar to Kowlun followed by Cecil Clementi, M. A., Assistant Colonial Secretary, Hongkong, 1907-08. Accompanies "Positions Determined by Mr. Cecil Clementi on his Journey from Kashgar to Hongkong," *Geogr. Journ.*, Vol. 40, No. 6, 1912, pp. 624-628.

[Shows the location of the greater number of a remarkable series of about 140 determinations of latitude and longitude made from July, 1907, to March, 1908, on a journey of about 4,000 miles from Kashgar to Hongkong along the northern edge of the Tarim Basin and the northeastern face of the Nanshan Range to the Hoang-ho at Lanchu, thence south across the Tsin-Ling-Shan and along the western rim of the Red Basin to Su-Chau on the Yang-tze-Kiang, down the latter to Chung-king and thence southeast to Hongkong. The positions determined are most numerous in the vicinity of the Bogdo-ola Range and in crossing the ranges between the Hoang-ho and the Red Basin. The figures of the principal positions are given in the text on pp. 626-627 and on p. 50 of this number of the *Bull.*]

INDO-CHINA. Das südliche Indochina. Nach eigenen Forschungen gezeichnet von Henri Maître. 1:1,000,000. 15°15′ - 10°55′ N.; 105°40′ - 109°30′ E. 2 colors. Taf. 41, "Das südliche Indochina" (first part) by H. Maître, *Pet. Mitt.*, Vol. 58, II, Nov., 1912, pp. 266-270.

[Valuable map based on a great number of the author's route surveys. The hydrography of the Central Plateau between the Mekong and the China Sea is shown very fully. Distinction is made between mountainous country and lowlands. Few towns shown.]

JAPAN. Japan to illustrate the paper by Ellen Churchill Semple. 1:5,000,000. 46° - 30° N.; 128° - 147°E. 7 colors. With inset: Part of Kotsuke & Shimotsuke Provinces. 1:500,000. 36°55′ - 36°30′ N., 139° - 140° E. 2 colors. Accompanies "Influence of Geographical Conditions upon Japanese Agriculture" by E. C. Semple, *Geogr. Journ.*, Vol. 40, No. 6, 1912, pp. 589-607.

[A hypsometric map in five colors showing the contours of 0, 300, 1,500, 3,000 and 6,000 feet, based on the Topographical Map of the Japanese Empire, 1:1,000,000, published by the Geological Survey of Japan. On the inset relief is represented by shading.]

PAMIR. Karte des Pamir von Arved v. Schultz. Auf Grund der russischen Karte in 1:420,000 unter der Benutzung der neuesten Quellen und nach eigenen Aufnahmen entworfen. 1:750,000. 39°50′ - 36°32′ N.; 71°25′ - 75°55′E. 7 colors. Taf. 28, "Bericht über den bisherigen Verlauf meiner Pamirexpedition 1911/12" (first part) by A. v. Schultz, *Pet. Mitt.*, Vol. 58, II, Oct., 1912, pp. 190-193.

[Valuable compilation of all available material supplemented by the author's own surveys. Drainage in blue, relief in brown shading. Distinction is made between three grades of roads, and there are separate symbols for summer and winter settlements, forts, posts, telegraph stations, mines, inns, market towns, ruins, cemeteries and passes. Moraine topography on the northern slope of the Trans-Alai Range shown.]

TURKEY IN ASIA. Die Anschlussbahn von Alexandrette an die Bagdadbahn. 1:400,000. [37°7′ - 36°35′ N.; 36°3′ - 36°15′ E.] Accompanies note on "Die Zweiglinie der Bagdadbahn von Topra Kale nach Alexandrette" by A. Janke, *Pet. Mitt.*, Vol. 58, II, Sept., 1912, p. 184.

TURKEY IN ASIA. Lower Mesopotamia from Surveys made under the Direction of Sir William Willcocks, K. C. M. G. 1909-1911. 1:500,000. 34°8′ - 31°32′ N.; 42°50′ - 46°6′ E. 3 colors. With inset: Continuation of R. Tigris to the

North on same scale. 35°0′ - 34°4′ N.; 43°28′ - 44°13′ E. 2 colors. Accompanies "Sir William Willcock's Survey in Mesopotamia" by H. G. Lyons, *Geogr. Journ.*, Vol. 40, No. 5 1912, pp. 501-503.

[Valuable map based on Plan No. 2 of Sir W. Willcock's Report on the Irrigation of Mesopotamia. The numerous elevations furnished by the great number of level lines run have been changed from the metric values of the original into feet, and contours have been drawn at an interval of 10 ft. See also map listed under "Turkey in Asia" (second entry), *Bull.*, Vol. 44, 1912, p. 937.]

EUROPE

BALKAN PENINSULA. Serbisch-montenegrinisch-türkischer Kriegsschauplatz. 1:1,000,000. 45⅖° - 41¼° N.; 17⅔° - 22¾° E. 8 colors. Taf. 47, "Der türkisch-serbische Kriegsschauplatz" by O. Kreutzbruck v. Lilienfels, *Pet. Mitt.*, Vol. 58, II, Nov., 1912, pp. 302-307.

[Photographic enlargement of part of Sheet 51 of Stieler's Handatlas. Fortifications and railroads emphasized by overprint in red.]

ENGLAND. (a) [Four maps of the lower Tyne (55° N. and 1½° W.) reproduced from old maps:] (1) Chart of the Tyne, 1670. [1:87,000.] (2) Chart of the Tyne, 1705. [1:84,000.] (3) Plan of Collieries of Tyne and Wear in 1787, Showing Wagonways. [1:200,000.] (4) Chart of the Tyne, 1853. [1:95,000.]

(b) [Three sketch maps of the lower Tyne district entitled:] (1) River Tyne at Newcastle. [1:40,000.] [50°57′ N. and 1°40′ W.] (2) Distribution of Population and Industries. [1:285,000.] [55°4′ - 54°50′ N.; 1°18′ - 1°50′ W.] (3) Strategic Road Map. [1:1,340,000.] [55°40′ - 54°40′ N.; 3°30′ - 1°15′ W.]

(c) River Tyne from Admiralty Charts. 1909. 1:50,000. [55°2′ - 54°57′ N.; 1°40′ - 1°22′ W.]

Accompany: maps listed under (a) on pp. 471, 473, 475 and 477, respectively; maps listed under (b), on pp. 479, 480 and 481, respectively, and map (c) as separate plate, "The Tyne" by A. J. Sargent, *Geogr. Journ.*, Vol. 40, No. 5, 1912, pp. 469-486.

[Map (b_1) shows relief by altitude layers in gray and distinguishes between passenger and mineral railroad lines. Map (c) also shows mineral railways separately and distinguishes between depths under and over 30 feet in the bed of the lower Tyne.]

GERMANY. Volksdichte des Regierungsbezirkes Arnsberg 1910. Mit Benutzung eines Gemeindekartogramss 1:100,000 gezeichnet von Karl Closterhalfen. 1:500,000. 51°50′ - 50°37′ N.; 4°18′ - 6°55′ E. 9 colors. Taf. 37, "Die Kartographische Darstellung der Volksdichte" by K. Closterhalfen, *Pet. Mitt.*, Vol. 58, II, Nov., 1912, pp. 257-259.

[Nine degrees of density shown; seven symbols used to differentiate cities according to size.]

ICELAND. Die Durchquerungen von Island durch die J. P. Kochsche Expedition. 1:2,300,000. 66° - 63⅞° N.; 19¼° - 15° W. Accompanies, on p. 186, "Die dänische Expedition nach Königin-Luise-Land und quer über das nordgrönländische Inlandeis 1912/13. I: Die Reise durch Island 1912" by J. P. Koch, *Pet. Mitt.*, Vol. 58, II, Oct., 1912, pp. 185-189.

ITALY. (a) Eruptionskegel des Vesuv. Aufgenommen und gezeichnet im August 1911 unter Benutzung der italienischen von Fiechter aufgenommenen Generalstabskarte von Alfredo Castiglione im Auftrag und unter Leitung von Immanuel Friedlaender, Neapel. 1:10,000. 40°49′ N. and 14°29′ E.

(b) Der Krater des Vesuv. Aufgenommen im August 1911 vom Topographen Alfredo Castiglione im Auftrag und unter Leitung von Immanuel Friedlaender. 1:2,500.

[Detailed maps of the cone and of the crater of Vesuvius showing the changes brought about by the eruption of 1906. Relief represented by contours and hachures, supplemented by excellent rock shading.]

SCOTLAND. Bartholomew's "Half-Inch to Mile" Map of Scotland. New Series. 1:126,720. (1) Sheet 9: Berwick & Haddington. 56°10′ - 55°35′ N.;

3°25′ - 1°58′ W. 12 colors. (2) Sheet 21: Inverness & Spey. 57°44′ - 57°11′ N.; 4°30′ - 3°3′ W. 14 colors. John Bartholomew & Co., Edinburgh.

[Two sheets of a new edition of the well-known half-inch-to-the-mile map of the British Isles with hypsometric coloring referred to under "England" in the *Bull.*, Vol. 43, 1911, p. 958.]

POLAR

ANTARCTIC. Sketch Map of the "Aurora" during the 1st Year of Australasian Antarctic Epedition under Dr. Mawson. Prepared by P. Gray, Navigating Officer of the "Aurora" under the direction of Capt. Davis. [Mercator projection: equatorial scale 1:48,000,000.] 54° - 72° S.; 89° - 175° E. Accompanies, on p. 448, note on "Dr. Mawson's Expedition", *Geogr. Journ.*, Vol. 40, No. 4, 1912, p. 447.

GREENLAND SEA. Fahrt der "Godthaab" nach Ostgrönland. [Mercator projection: equatorial scale 1:30,000,000.] 77° - 63° N.; 25° W. - 0°. Accompanies, on p. 158, note on "Hauptm. J. P. Kochs geplante Durchquerung von Nordgrönland", *Pet. Mitt.*, Vol. 58, II, Sept., 1912, pp. 157-158.

[Shows route of the *Godthaab*.]

WORLD AND LARGER PARTS.

WORLD. [Eight maps of the world on Mollweide's projection, entitled:] (1) Mean Annual Temperature. [1:315,000,000.] (2) Thermal Belts. [1:315,000,000.] (3) Temperature Belts (Isotherms of Warmest and Coldest Months Calculated for Sea-Level). [1:170,000,000.] (4) Actual Temperatures, January. [1:245,000,000.] (5) Actual Temperatures, July. [1:245,000,000.] (6) The Chief Thermal Regions of the World. [1:245,000,000.] (7) [Distribution of temperature according to number of months over 10° C.] [1:170,000,000]. (8) Thermal Regions. [1:196,000,000.] Accompany, as Figs. 1 to 8, on pp. 519-523 and 525-527, respectively, "The Thermal Regions of the Globe" by A. J. Herbertson, *Geogr. Journ.*, Vol. 40, No. 5, 1912, pp. 518-532.

[Highly valuable maps illustrating a new method in delimiting temperature regions—a preliminary study in Dr. Herbertson's investigation of the natural regions of the world and their boundaries, based on the consideration of all the geographical factors involved.

Fig. 1 is one of the usual type of temperature zone maps showing a selected number of mean annual isotherms, in this case, 0°, 10° and 20° C. Fig. 2 is a reproduction on Mollweide's projection of Supan's temperature zones as defined by the mean annual isotherm of 20° C. and the isotherm of 10° C. for the warmest month. Fig. 3 is a map already published by Dr. Herbertson on which the 0°, 10° and 20° C. isotherms for Jan. and July have been superimposed.

The new method is exemplified by the remaining figures. Figs. 4 and 5 show the land areas enclosed by the 0°, 10° and 20° C. isotherms for Jan. and July, *not* reduced to sea level. For comparison the same isotherms, reduced to sea level, are shown both for land and sea. The actual temperature lines for Jan. and July are superimposed upon each other on Fig. 6 and the ten thermal regions enclosed by them are designated (1) cold at all seasons, (2) cool at all seasons, (3) cool summers, cold winters, (4) warm summers, cold winters, (5) warm summers, cool winters, (6) hot summers, cold winters, (7) hot summers, cool winters, (8) hot summers, warm winters, (9) warm at all seasons, (10) hot at all seasons. Another climatological element is illustrated in Figs. 7 and 8 which show the distribution of temperature according to the number of months in which certain temperatures prevail. Here again actual temperatures are used, not reduced to sea level. Fig. 7 shows the number of months with temperatures above 10° C. Fig. 8 shows the number of months with temperatures (1) over 10° and under 0° C. and (2) over 20° C. and under 0° C., using seven gradations in each scale. Thus, for instance, the Gulf coast of the United States is shown to have 7 to 8 months over 20° and no month under 0° C., and the greater part of the Archean "shield" of Canada, 1 to 3 months over 10° C. and 6 or more months under 0° C.

The manner of reproduction of Figs. 4, 5 and 6 unfortunately does not insure the legibility of these important maps. These are, however, accessible as colored wall maps published by the Oxford University Press.]